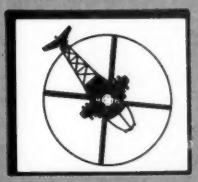
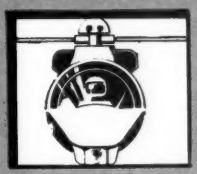
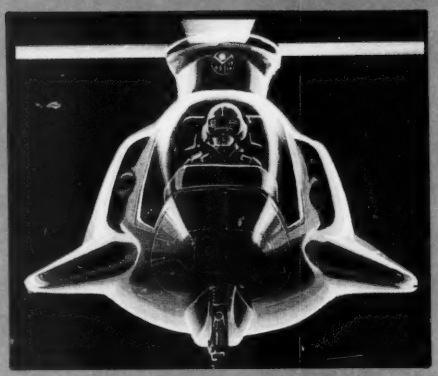
UNITED STATES ARMY

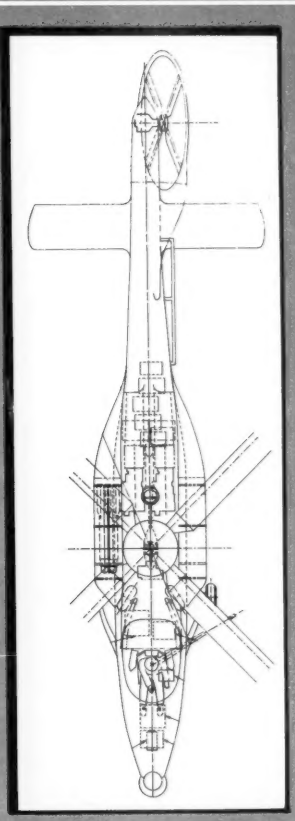
AVIATION DIGEST

DECEMBER 1986









Light Helicopter Family

DECEMBER 1986 • VOLUME 32 • NUMBER 12

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Cover: **The variety of concepts displayed by these artists shows the vast range of possibilities for the Light Helicopter Family (LHX). Requirements for and capabilities of the Army's future helicopter fleet are addressed in our series on LHX beginning on page 2. Artwork courtesy of Boeing/Sikorsky, McDonnell Douglas/Bell Textron and IBM.**

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The mission of the *U.S. Army Aviation Digest* (USPS 415-350) is to provide information of an operational, functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine and other related data.

The *Digest* is an official Department of the Army periodical published monthly under the supervision of the commander, U.S. Army Aviation Center. Views expressed herein are not necessarily those of the Department of the Army nor the U.S. Army Aviation Center. Photos are U.S. Army unless otherwise specified. Use of the masculine pronoun is intended to include both genders unless otherwise stated. Material may be reprinted provided credit is given to the *Aviation Digest* and to the author unless otherwise indicated.

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Use of funds for printing of this publication has been approved by the Secretary of the Army, 19 February 1985, in accordance with Army Regulation 310-1. Second-class postage paid at Daleville, AL, and additional mailing offices.

Active Army units receive distribution under the pinpoint distribution system as outlined in AR 310-2. Complete DA Form 12-5-R and send directly to CDR, AG Publications Center, 2800 Eastern Boulevard, Baltimore, MD 21220. For any change in distribution requirements, initiate revised DA Form 12-5-R.

National Guard and Army Reserve units under pinpoint distribution should submit DA Form 12-5-R. Other National Guard units submit requests through their state adjutant general.

Those not eligible for official distribution or who desire personal copies of the *Digest* can order the magazine from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

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Major General Ellis D. Parker
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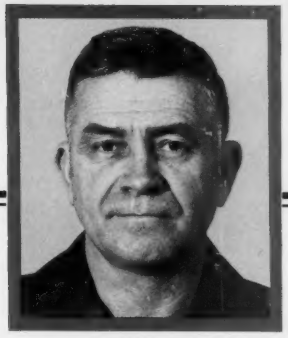


93B Aeroscout Observer Course

ON 1 OCTOBER 1986 the Army Aviation Branch and the United States Army Aviation Center, Ft. Rucker, AL, welcomed its newest enlisted military occupational specialty (MOS) and MOS producing course, the 93B Aeroscout Observer. The purpose of the Aeroscout Observer Course is to provide the soldier with the necessary skills and knowledge leading to qualification as an aeroscout observer in the OH-58A/C aircraft. This training will enable him to be a functional member of the scout/attack team.

Creation of the 93B MOS was a culmination of more than 3 years of testing and training to establish the viability of the enlisted aeroscout in the OH-58A/C aircraft. The first of these tests was conducted by the U.S. Army Aviation Board. The Scout Observer Unit Test (SCOUT I) examined measures to systematically select, train, qualify and manage the aeroscout observer. The program of instruction (POI) that resulted from this test was a combination of Initial Entry Rotary Wing Aeroscout Observer POI, the U.S. Army Armor Center exportable Aeroscout Observer POI, the British Army Observer POI, and the Canadian Army Observer POI. A follow-on test, Scout Observer Unit Test (SCOUT II) was conducted by the Army Development Experimentation Activity and the Combat Development Experimentation Command. It provided associated data analysis on the capability of a single pilot/nonrated crew to conduct day/night operations in comparison to a rated crew.

Findings of the SCOUT I and II tests proved that the enlisted aeroscout observer was a viable concept in the OH-58A/C aircraft and resolved the two pilot versus single pilot/observer concept.

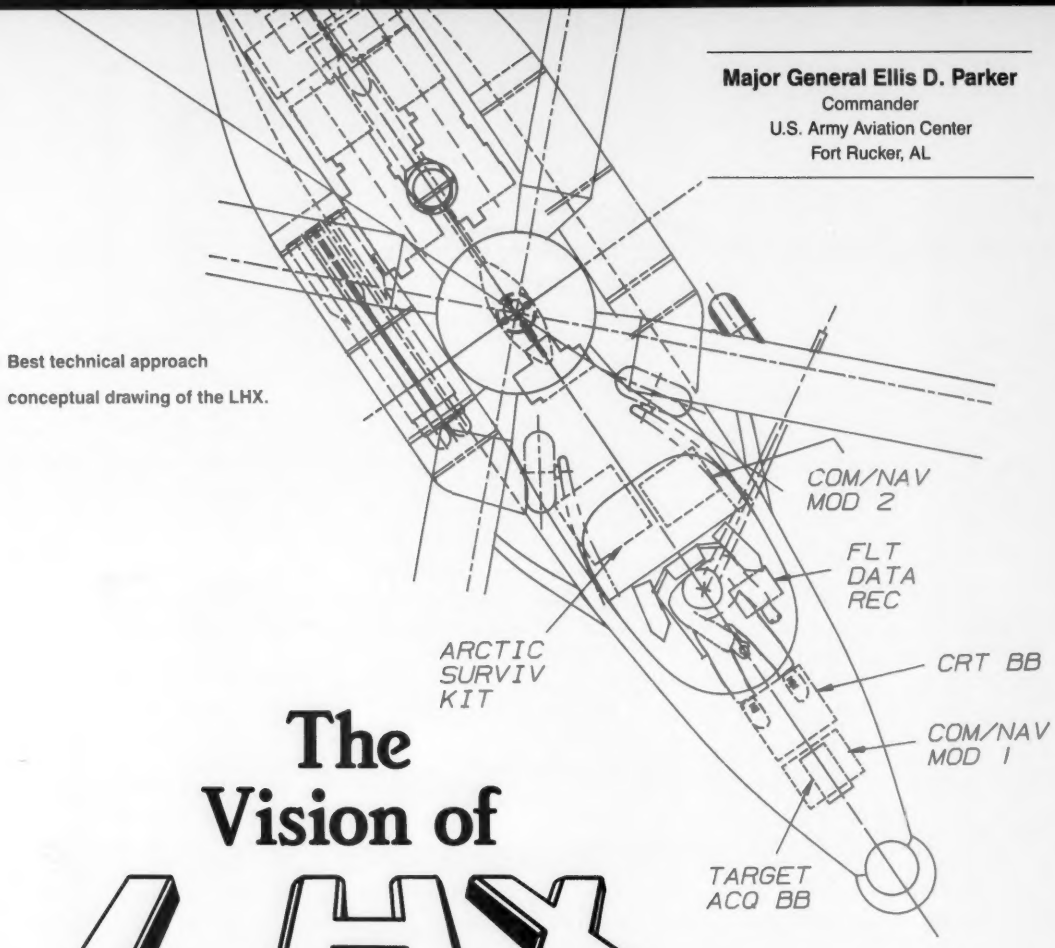
The first Aeroscout Observer Course was initiated in September 1984 as a 5-week, 4-day course, consisting of 159 academic hours and 11.7 flight hours under the proponency of the Department of Combined Arms Tactics at the Aviation Center. The course length was increased to 11 weeks, 1 day on 1 October 1985 to provide increased flight time from 11.7 to 67 hours and additional training in combat skills and night vision goggles. Soldiers who attended were qualified 67V OH-58 helicopter crewmembers and were awarded the additional skill identifier of ZI upon completion of the course.

On 16 August 1985, the decision of the Army Vice Chief of Staff established the aeroscout observer as a stand alone MOS and designated the course as an advanced individual training (AIT) MOS producing course. Proponency was transferred to the Department of Enlisted Training, which has responsibility for all AIT training at the Aviation Center. The course has been expanded to 14 weeks, 3 days. It now consists of 67 flight hours in emergency aircraft handling and aeroscout skills and 330 academic hours in combat skills, aircraft systems, navigation, map reading, NBC (nuclear, biological and chemical) and soldier skills that culminate in a 2-day field training exercise.

Addition of this new MOS to the Aviation Branch will enhance the team concept between our enlisted soldiers and officers. Our aviation soldiers provide maintenance and air traffic control support, and now with the addition of the aeroscout observer, they are integrated into the cockpit crewmember team involved with the air-land battle.

Training the aeroscout observer presents a great challenge to our instructors here at the school and to all aviation units worldwide. I am confident this course will provide the Aviation Branch with highly skilled and motivated soldiers to perform the aeroscout mission.

Major General Ellis D. Parker
Commander
U.S. Army Aviation Center
Fort Rucker, AL



Best technical approach conceptual drawing of the LHX.

The Vision of LHX

"Where there is no vision, the people perish."
Proverbs

MOST OF YOU have been following the progress of the Light Helicopter Family (LHX) with great interest in various articles and publications. This issue of *Aviation Digest* and the one following in January are dedicated to bringing you the latest information available about the LHX program.

Many people have asked, "Why LHX?" At an average cost of slightly more than $5 million a copy, the program represents a large expenditure to replace our current light aircraft fleet. However, our senior leadership has declared that the LHX is the number one research and development program in the Army. The need is well substantiated.

Throughout the history of warfare, decisive victories have been achieved by numerically outnumbered forces, when those forces were better equipped and better trained than their enemy. We have done well against superior odds in the past; however, we cannot rely on our existing equipment and present training techniques to continue to provide the competitive edge against superior numbers of enemy forces in the future. A sampling of major threat systems expected in 1995 is shown in figure 1.

These future threat forces will be formidable. Air-to-air combat will be decisive. There will be a need to strike deep into enemy territory to

disrupt his attack and to destroy his logistical support lines. We must have the capability to shift combat power rapidly to any part of the battlefield on very short notice. We will be fighting against a staggering number of enemy air defense weapons. Indeed, we will need aircraft that will be both lethal and survivable if we are to be victorious. The Chief of Staff of the Army has said, "Capitalize on enhanced technology to increase combat power, thereby offsetting the inherent risks of a fiscally restrained force."

Costs of sustaining and upgrading our current fleet to counter the future threat would be prohibitive and only marginally effective. The Army's current light fleet will have an average age of 35 years by the time the bulk of a new fleet can be fielded. Our mission area analysis report has documented 34 materiel deficiencies that prevent full aviation implementation of air-land battle doctrine and Army 21 concepts. Most of these deficiencies stem from the fact that our old fleet technology is from the 1950s. A UH-1H Huey on a hot day in the Mideast can carry its crew of three, fuel and only one combat equipped soldier. Under the same conditions, an AH-1S Cobra with crew and 1 hour of fuel can carry only two antitank missiles, while the OH-58A Kiowa has no useful load.

Considering this, it is quite evident that if we are to be prepared to fight anywhere in the world, we must have aircraft with greater capabilities. Upgrading our old workhorses to accomplish these missions would be too costly. They were machines to be reckoned with in their time, but trying to upgrade them technologically (if that is possible) would be more costly but less effective than starting from scratch. Clearly, we must have new combat systems and training that capitalize on high technological opportunities if we are to defeat future enemy forces.

Close your eyes for a moment and try to imagine an aircraft capable of meeting these challenges on the future battlefield. Chances are that you will conjure up a craft that is light, fast, highly maneuverable, capable of phenomenal lethality, agility and survivability in multimission roles. It would probably be pilot-assisted by high speed integrated circuit computer technology that would be voice controlled and provide automatic targeting and weapons control. It would be capable of flying in any type of weather and have a host of futuristic sensors and systems with capabilities similar to those portrayed on "Air Wolf" and "Blue Thunder" with a little "Star Wars" thrown in. And chances are good that your future helicopter would be very close to our vision of LHX.

The LHX development is the product of the vision of a great many people who early in the development phase coined the term "business NOT as usual." That phrase has been the motto of LHX since then. The LHX incorporates radical changes from the way we used to think about systems and the way to employ them. Advances in science and technology have made these radical changes possible. Guidance contained in the Army Plan tells us to: "Direct research and development efforts toward high-leverage, high-payoff programs that exploit technological advances."

The LHX will meet many of our future battlefield needs. Indeed, it will incorporate most of those things you have imagined, and probably more. The LHX will be configured as either a utility or a scout/attack (SCAT) aircraft. The SCAT will be a paragon that incorporates the most advanced technologies. It will use advanced rotor technology integration, hands-off hovering capability, and digitized maps displaying navigation and targeting information about the enemy it detects along the route of

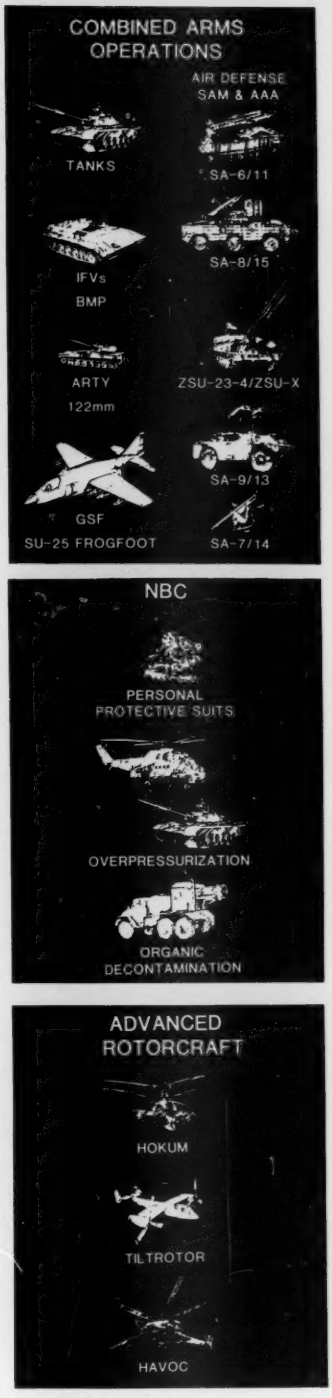


FIGURE 1: 1995 Threat

flight. It will see without being seen, engage the enemy outside the range of his weapons systems and be the most deadly combat vehicle on the battlefield. It will be survivable, reliable, easily maintained and have at least 70 percent component commonality with its utility-version counterpart. Human factors engineering will have been incorporated from the start, ensuring excellent man-machine interface through cockpit architecture and other unique features. The LHX will take advantage of the latest in computer science and pilot-assisted technologies that will allow the SCAT to be a single-pilot design.

The LHX will be capable of conducting nap-of-the-earth operations continuously throughout the entire battlefield against a sophisticated threat with the capability to use nuclear, biological and chemical (NBC) and directed energy weapons. It will have an integrated and automated cockpit with worldwide navigation capability, and secure, electromagnetic pulse and electromagnetic interference hardened avionics. It will be self-deployable to Europe and deployable by tactical air transports.

The capabilities of the LHX will expand Army Aviation's ability to perform missions in adverse weather and over all terrain. These capacities include air-to-air combat, deep attack, continuous day and night operations on the integrated battlefield, more rapid tailoring of units to meet the demands of the fluid battlefield and increased ability to remain in the battle.

Because of the small profile of the LHX, and because of its survivability features, it will be able to see the enemy without being seen. This trait provides a considerable advantage over enemy forces and contributes to its phenomenal lethality and survivability.

The real lethality of the LHX comes from its ability to rapidly vary configurations, from pure scout up through fully armed attack with the minimum number of mission kits, and the incorporation of advanced target acquisition, prioritization and handover capabilities. This machine will redefine the definition of lethality as we have known it.

Take the target acquisition system (TAS) for example. The TAS will be capable of manual and aided searching; detecting; tracking, cueing and designating; and presenting recognized and prioritized targets including rotary and fixed wing aircraft, tanks, air defense systems, armored personnel carriers and nonarmored ground systems to the pilot. It will be fully integrated with onboard sensors and weapons systems and will permit pilot confirmation and override. The TAS will be capable of sequential engagement of multiple targets, completing the fire control solution, and permitting launch of ordnance in a very short time after detection.

A truly unique capability in target acquisition and engagement comes from the aided target recognizer (ATR). It permits the pilot to unmask, quickly scan the horizon for targets, and then return to mask. Images gathered during the pop-up are stored and processed with the aid of the very high speed integrated circuit processors. Once the pilot has returned to a masked position and activates the automatic hover-hold, he can scan the targets displayed on the helmet mounted display, confirming those of importance and set the priority of engagement if different from what he previously set in. The ATR will detect, classify and then prioritize targets for the pilot. Once he confirms the targets, he may pass off certain targets to his wingmen or to other assets capable of attacking those targets or he may elect to attack all targets himself, depending on the number.

The weapons integrated systems are lethal. Briefly, the multipurpose launcher system will be internally mounted or contained in external conformal pods with the capability of launching semiactive laser HELLFIRE missiles, fire-and-forget HELLFIRE missiles, the HYDRA-70 family of rockets, and air-to-air missiles (ATAMs). A turreted gun system will be an integral part of the system and will be contractor provided, conforming to the performance and lethality that we have defined. The missile or rocket systems will be capable of being fired simultaneously with the gun system.

But let's not become confused about what LHX is or is not. It is a light aircraft, not an Apache in terms of the ordnance it can carry. Let me quote a sentence we have included in the requirements document that will give it a distinct advantage with rapid turnaround time.

> "The LHX will be capable of being rearmed with 4 HELLFIRE, 2 ATAM and a basic load of gun ammunition in less than 15 minutes by 2 people in NBC protective clothing without the assistance of special ground equipment."

With this capability, the LHX can operate out of jump forward arming and refueling points, rearming and returning to the battle very quickly, thus significantly contributing to our forces' effectiveness in the battle.

Another big "business not as usual" falls in the area of the LHX training system. *Notice that I said system.* From the very start, the training system and aircraft development were required to be in synergy to reduce the system's training burden. The LHX prime contractors will be responsible for the development of the integrated training system, including hardware, software, courseware, consumables, facilities, and instructor and support personnel. Embedded

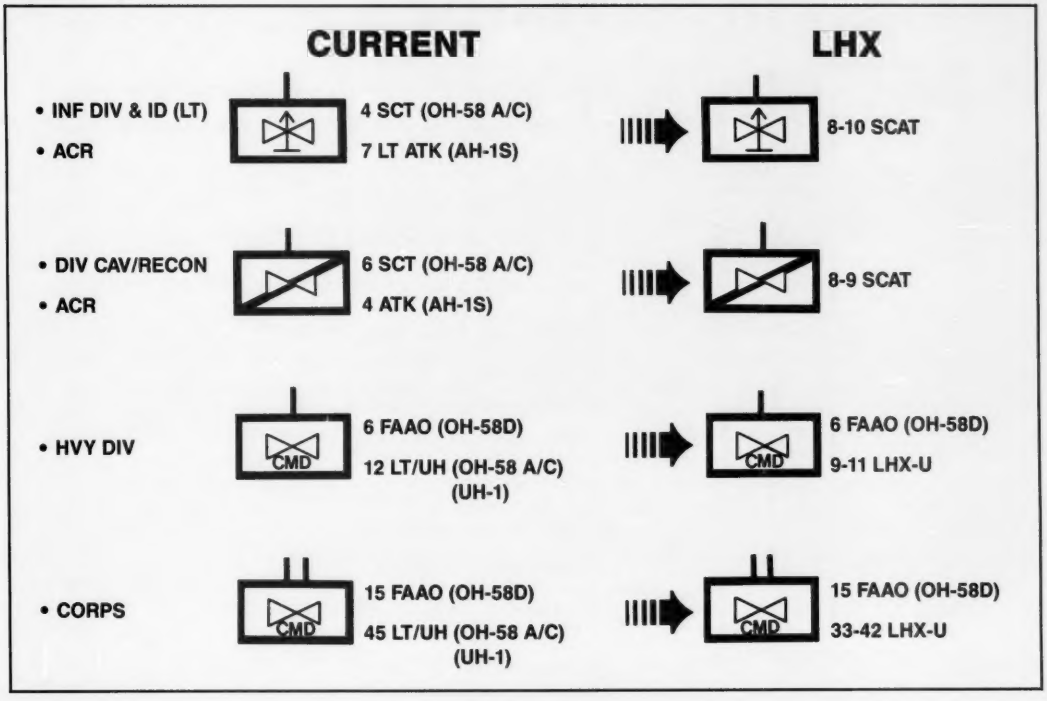
training in the LHX will allow the use of the aircraft systems as a training media and will provide for realistic force-on-force training with currently fielded systems. This means that we will have a very effective synthetic trainer within the aircraft itself. We will have combat mission simulators that will allow training in en route navigation, air-to-air and air-to-ground engagements while on the ground. Additionally, we will have the capacity to practice aircraft survivability and electronic warfare training, and scenario practice with embedded performance feedback. Embedded maintenance training also will be possible.

Let me take a moment to refresh your memory on the role of the LHX. It is not designed to be a "do all" aircraft. It is intended to replace our light fleet of UH-1, AH-1, OH-58 and OH-6 aircraft only. It will not replace, but rather complement our heavy fleet of AH-64, AHIP (Army Helicopter Improvement Program) and UH-60 helicopters. Figure 2 shows a comparison between current organizational assets and how these would translate into LHX-configured organizations. It will be the combined capabilities of the future light and heavy fleet that will form the basis of an effective aviation force that will provide the commander unprecedented firepower and maneuver. And although the LHX will be very capable of independent operations, it is important to realize that it will be an integral part of the entire aviation team that will reshape the battlefield of the future.

The real advantage that LHX will offer is its flexibility to be employed throughout a wide range of multipurpose missions, and malleability of being task organized from single ship autonomy through joint task force integrated assets with ease and compatibility. I know of no other major combat system that can accomplish that task with the ease that we have given to the LHX.

The LHX program is the Army's biggest undertaking ever, and it is a truly unique program in many respects. In the articles that follow, I think that you will find an exciting and clear affirmation that the Light Helicopter Family is indeed the answer to the Army's light fleet needs on the battlefield of the future. The vision of LHX is our vision of the future. **LHX**

FIGURE 2: Organizations



MONTHLY WRITING AWARD

All of the graphics and some of the concepts are notional and may or may not be included in the final design.

The Aviator's and Maintainer's Perspective

AS THE C COMPANY commander pulled off his helmet, he leaned back in the seat of his scout/attack (SCAT) and sighed in relief. A, B and C Companies had been fighting 18-hour cycles of 6 hours up and 12 hours rest and repair for 4 consecutive days, until relieved by 3d Battalion. Now they had some time to accomplish deferred repairs and rest before jumping back into the fight. The Light Helicopter Family Utility (LHX-U) and SCAT helicopters had done well and, as the maintainers worked to repair the battle damage, the commander thought back to their alert notification and pondered the events of the past several days.

C Company had been given the notice to deploy only 2 weeks ago, and with minimal preparation, the aircraft were ready. The overwater legs were 6 to 8 hours long, but the excellent stabilization and navigation systems made the flights much less fatiguing than flying previous aircraft. At one of the en route stops, a mixing transmission on one of the SCATs was damaged and had to be replaced. An LHX-U unit had been pre-positioned to aid other units during their deployment and had one of the transmissions onhand. Fortunately, it didn't matter that the transmission belonged to a utility unit, because 70 percent of the parts are interchangeable between SCAT and utility models. It was a simple, direct exchange and installation.

Once incountry, but before the fighting started, the utility LHXs proved their ability by operating around-the-clock in what used to be nonflyable weather. The

Major Christopher L. Sargent
Assistant TRADOC System Manager
for the Light Helicopter Family
Fort Rucker, AL

LHX-U is a two-seat, but single-pilot-operable aircraft; this allowed one pilot to fly in each aircraft, and the others to rest in the company area, that is until the fighting began and both pilots were needed. Because of increased reliability of our new aircraft, a properly developed and adhered to standing operating procedure is of paramount importance. The ability to move 8 troops internally, or slingload 4,000 pounds on the cargo hook was great. The LHX-U also was in high demand for command and control (C^2) missions, where senior commanders monitored the forward movement of their units using an installed C^2 radio console. Medical evacuation versions were used to carry early casualties in the LHX-U four-litter configuration, complemented with an efficient station for the flight medic. The SCATs, meanwhile, used their 3,000 pound external hooks to move the forward arming and refueling point (FARP) equipment forward, as well as some of the unit's lighter supplies.

Whoever conceived the LHX maintenance concept deserved a medal. The key to success was superior reliability and maintainability. The average time to repair was only about 40 minutes, much better than the older helicopters, and the time the LHX endured between repairs was also improved. This made for more staying power on the battlefield. The emphasis on MANPRINT, or designing by thinking of the man-machine and not just the piece of equipment itself, had paid off. Every operator, maintainer and supporter task was examined to see which ones should be automated and which ones shouldn't. The result was an aircraft that was significantly easier to fly, maintain and support. Military occupational specialties (MOSs) were modified as well. In some cases analyses determined that the repairs traditionally done by two MOSs could be done by one because of the reliability and maintainability improvements. This meant fewer repairers could take care of more of the aircraft's systems. As another SCAT returned to the company area, the commander's thoughts drifted back to the unit's mission.

The most recent day of conflict brought out the best in the LHX, a day that started with an antiarmor mission (figure 1). Just when the fighting was getting heavy, three enemy Hokums, designed for air-to-air combat, crossed the forward line of own troops (FLOT), in what was apparently a move to envelop the company. Three SCATs broke from the antitank engagements for the counterair attack.

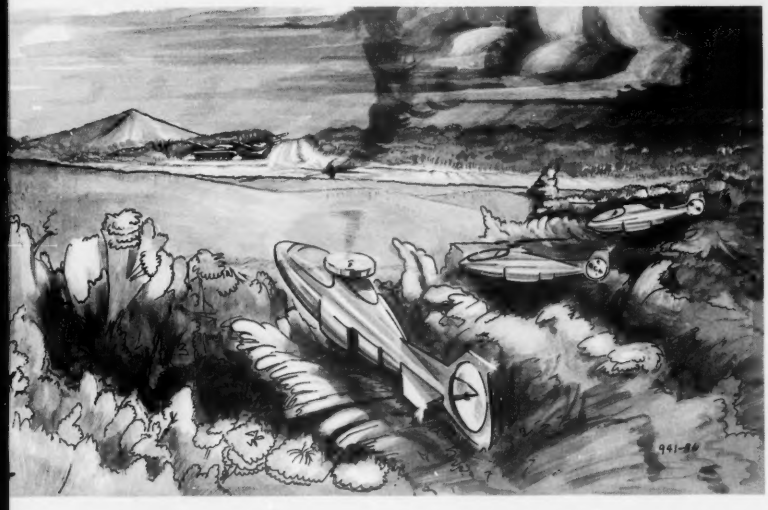
The SCAT had been designed with mission flexibility in mind, which included the capabilities to be an effective tank killer as well as the best air-to-air combat helicopter in the world (figure 2). A key to this flexibility was the computer. A *single* computer, divided into three modules for survivability, integrated input from many components. If one of the modules received damage, the very high speed integrated circuit (VHSIC) computer reconfigured itself to maintain the higher priority functions allowing the pilot to continue the mission.

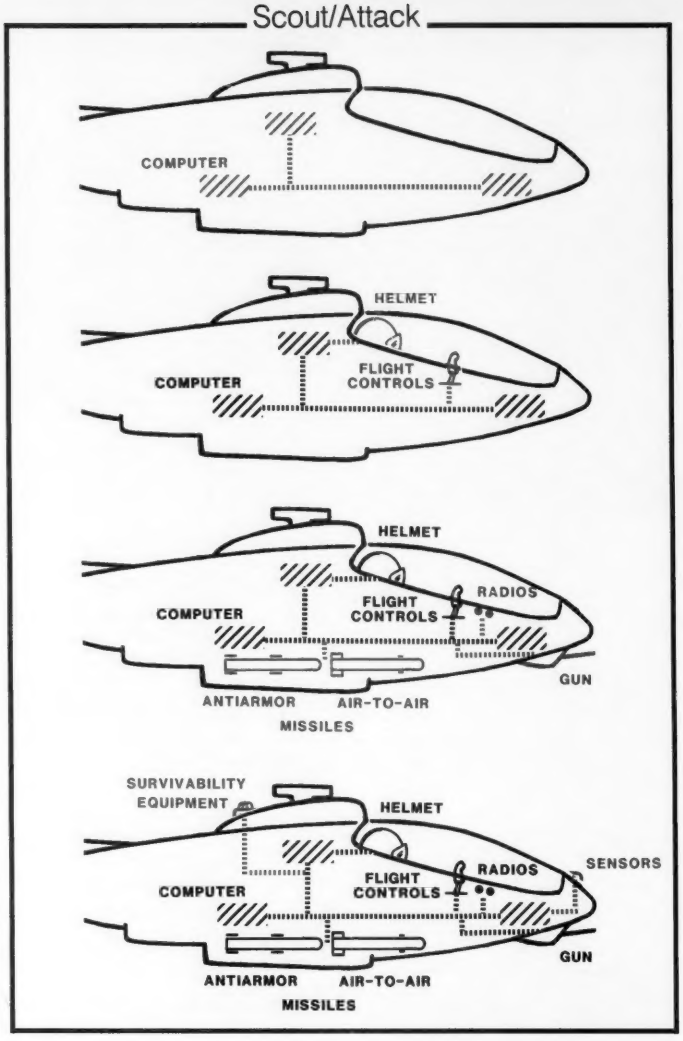
It provided enough computing power to automatically acquire targets, control flight, automate communications functions, present a map display for navigation, automatically cue a weapon system and operate the helmet mounted display—all simultaneously!

The helmet mounted display proved its worth as well by allowing the pilots to keep their eyes out of the cockpit. Armament and sensor information was projected on the inside of the pilot's visor allowing him to activate and direct weapons systems by voice control and head movement. If an aircraft system was damaged or inoperable, the pilot was warned and given the emergency procedure on one of the control panel readouts.

Aircraft survivability features weren't neglected either. The pilot could override the computer and "go manual" should the computer receive damage or if he preferred to use the system in his own way. Sophisticated equipment made it tough for enemy radar, lasers, in-

FIGURE 1





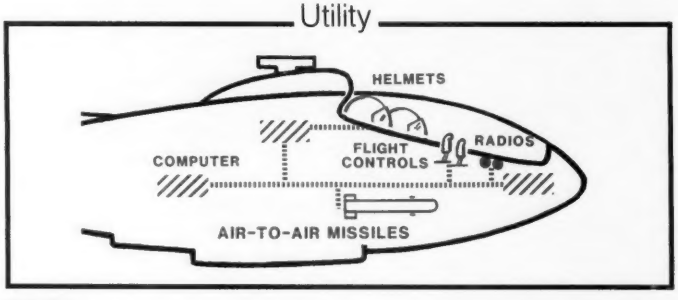


FIGURE 2

frared systems and electronic devices to spot and track the elusive LHX. All of the electronic systems were protected from electromagnetic interference and pulses that could inactivate other ground and airborne systems. These features worked and kept the LHX in the fight longer.

Back at the FLOT, as one of the SCATs maneuvered to intercept one of the Hokums, the computer helped by automating the weapons selection (figure 3). For longer distances an air-to-air missile would have been the best choice, but for this engagement the turreted gun system was the answer. The computer, through the sensors, was aware of target location and "automatically" activated the gun system and began computing the trajectory for gun elevation and azimuth. With the correct lead angle, the helmet mounted display indicated the system was ready to fire by putting a blinking reticle around one of the three Hokums (figure 4). The only action required by the pilot was to fire the selected weapon at his discretion (figure 5). If the pilot felt it was necessary, he could override any of the computer's choices and manually step through the engagement sequence.

These chance, close-in engagements were typically quick and were decided by the aircraft that could direct accurate weapons fire first. The key to winning was to have an aircraft with a high roll rate, rotor blades with a wide chord and a high power margin. Speed was not as important once the decision to engage had been made. The T800 engines helped during maneuvering by providing the extra power needed without any rotor overspeed or droop. This was a result of the digital fuel control that could respond to the power demand almost as soon as it was

needed. The computer had done its share as well by considering many factors, to include the wind, temperature, aircraft power setting, the recoil force of the gun and how it would affect the aircraft's flight path, and the gun mount's deformation or twisting. It also considered the pilot's desired flight path through input from the sidearm controllers.

The most amazing thing the computer could do, though, was think like the enemy with its "tactics expert function." It provided the "most likely" direction the enemy helicopter would turn based on enemy tactics and doctrine and put these cues on the helmet mounted display. This was useful for air-to-ground targeting as well by indicating likely command vehicles within a formation or the possible location of air defense artillery threats. This use of artificial intelligence, programed into the computer's software, allowed updates as enemy tactics changed.

During these engagements there was no time to check the cockpit displays for critical power, airspeed or altitude information, but the pilots didn't have to. Information projected on the helmet mounted display allowed "eyes out of the cockpit" flying. It didn't overwhelm them with all the normal information, only that which was critical at a given moment in time. Other means of man-machine communication were used as well, such as a computer voice warning of threat antiaircraft search radar and a vibrating sidearm controller when approaching maximum speed. All of these features were aimed at reducing pilot workload to a manageable level during the most demanding conditions.

The Hokum and Havoc pilots hadn't learned yet that they should stay away from the LHXs, but then

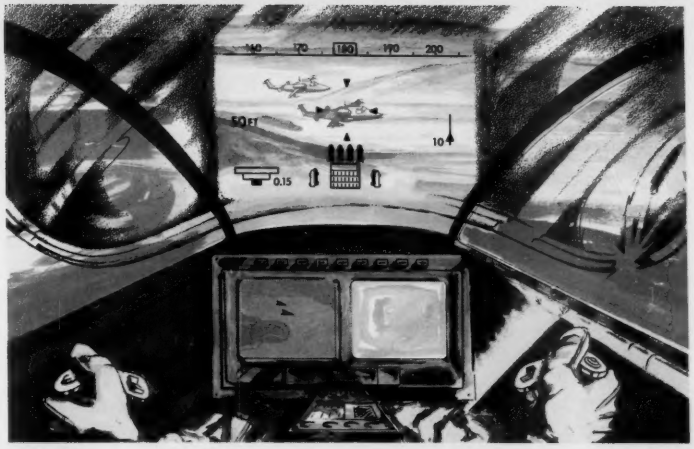


FIGURE 3

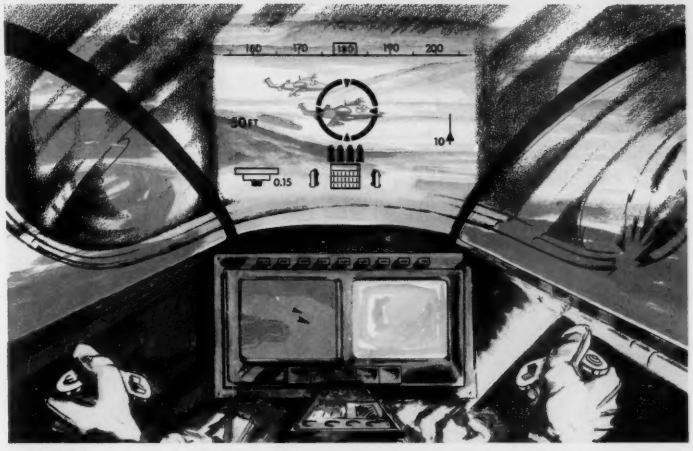


FIGURE 4

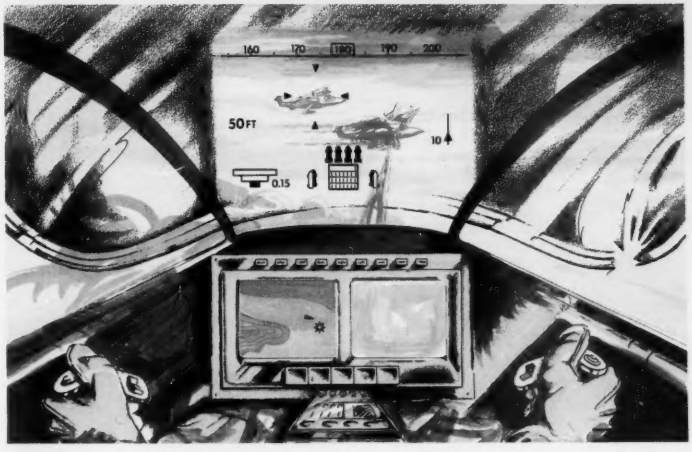


FIGURE 5

not many made it back to tell. With the Hokum encounter over, the SCATs returned to the FARP for more fuel and ammo. Turnaround times at the FARP were good and this was obviously something considered early in the design. The manual effort required for refueling and rearming the LHX had been reduced significantly when compared to other helicopters. Two men could rearm and refuel a SCAT with a basic load in about 15 minutes, quite an improvement.

Returning to the antitank engagement, one of the SCATs was hit with 12.7 mm small arms rounds, and had to return for maintenance (figure 6). On the way back, the condition monitoring system automatically began troubleshooting to find damaged electronic components. Because the VHSIC computer chips were designed with "built-in test" features, and self-testing for all electronics was emphasized from the start, there was a good chance all electrical components needing replacement could be quickly identified prior to arrival at the maintenance area.

Once on the ground, the cockpit displays summarized the electronic parts that needed replacing. Meanwhile, a visual airframe inspection revealed composite skin damage and some broken wires in a wiring harness. The avionics repairman went for the electronic modules while the crew chief found the battle damage repair kits for composites and wiring. These kits had been designed for speedy repair; getting the aircraft back in the battle. Although they were expedient, the quality of the repairs was excellent and would allow the LHX to fight until sufficient time was available for more durable repairs.

Composite repair cure times had been reduced considerably from the old "cure at least a day" times of years ago, and the broken wires were reconnected using short sections of wire with connectors preattached to the ends. The wiring repair completed, was now waterproof, and as a heat blanket was taped over the composite patch, the electrician replaced the electronic modules. After a short wait for the composite patch to cure, the SCAT was ready and joined the remainder of the company forward.

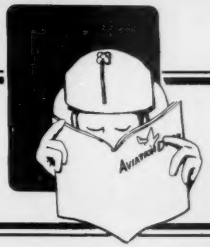
This was the point where 3d Battalion relieved our battalion and gave the company a breather. Back at the rear, C Company commander checked that the maintenance was doing well and that his pilots were being taken care of. The tactical situation required the battalion's reengagement within 24 hours, so this would be a short rest.

The LHX had done well and had the respect of the entire company as well as the other units in the task force. It had proven itself in combat by being able to shoot, move and communicate around-the-clock in the toughest of conditions. Indeed, it was an aircraft that was designed to fit the user. A combat machine that gave the soldier-pilot superior firepower and maneuverability. LHX, the helicopter of the future. **LHX**

FIGURE 6

Major Sargent would like to thank the members of TSM-LHX—LTC (P) Gram, LTC Neil, LTC Gordon, MAJ Rusho and MSG Christensen—for their assistance in preparing this article. The fine art illustrations of Mr. Bob McGraw, TASO, Ft. Rucker, are appreciated as well.

VIEWS FROM READERS



Editor:

Activation of the 82d Aviation Brigade will take place on 15 January 1987 on the main post parade field at Ft. Bragg, NC. The ceremony will include the inactivation of the 82d Combat Aviation Battalion. We would like to invite any persons who were affiliated with any aspect of the aviation units within the 82d Airborne Division to participate in this event. In addition, the establishment of an 82d Aviation Historical Society is underway. We are soliciting information, photos and memorabilia of any 82d Aviation element.

Contact action officer, MAJ Samuel Massenberg at: AUTOVON 236-9435/6356, Commercial 919-396-9435/6356 or write Commander, 82d Aviation Brigade, ATTN: S3, Ft. Bragg, NC 28307-5100.

MAJ Samuel E. Massenberg Jr.
Ft. Bragg, NC

Editor:

It may interest former members of the 282d Aviation Company and the aviation community to know the unit is converting from the UH-1 to the UH-60 Black Hawk.

The first Black Hawk aircraft arrived at Ft. Rucker in June; additional aircraft will be assigned in 1986 and 1987. Unit soldiers are currently undergoing transition training. The unit plans to complete the transition and undergo its first ARTEP as a UH-60 unit in 1988.

CW3 Rush Wicker
282d Aviation Company
Ft. Rucker, AL

Editor:

I just finished reading the article on maintenance specialization in the August 1986 *Aviation Digest*, by Major (P) Snow and CW3 Franklin. The Army spends good money to send the best qualified people to a 66-series* school to specialize in one family type of aircraft. If a 66V has to go out and do a 66N job it's mismanagement of the 66V. Let's just bring back the 67W and 67F military occupational specialty (MOS) that would cure the problem. What did the quality control section do before it had 66N, 66T, 66V, etc., etc., to perform technical inspector (TI) duties? A 67W is a quality control supervisor, a supervisor of 67N, 67V and 67T. What experience does that 66N have on OH-58 or AH-1 aircraft? Does quality have to suffer because that 66N is at the range or is off from duty? NO!

As the article stated, Army Aviation is becoming more sophisticated. How can TIs keep up with the sophisticated aircraft if they must stay current with two or three types of aircraft? Let's promote some of those highly motivated TIs to 160As and let them fill the old shoes of 67Ws. Being 66Ns, 66Ts, etc., are very demanding jobs. They also are some of the most scrutinized sections in the unit when it comes to an arms inspection. So, let's take the 66Ns or 66Vs and have them go out and inspect a U-21 or a UH-60 aircraft for which they may or may not have had formal training.

AR 611-201, "Enlisted Personnel Management System," has all the career management field in the 66 series MOS, and it is also broken down by rank structure—so, how can a quality control office lose its experience if a 66N30 or 66V30 by AR 611-201 is supposed to supervise the 66N20 or 66V20? Quality control is a management function, so a senior TI should be assigned as the supervisor of the quality control section. When they took away the 67W MOS, yes, they lost the section supervisors. Maybe Army Aviation unit commanders need to look at their quality control sections and make the changes if needed. TIs work for their commanders, not the maintenance officers. So to say that a TI has no place on the modern battlefield is an understatement, especially when that UH-1 or AH-1 is broken on the battlefield. Who's going to go inspect that aircraft on the battlefield—the unit commander; the quality control officer; or maybe the nuclear, biological, chemical noncommissioned officer?

Take a look at your unit's TIs, see how long they work, and [how well] under the numerous types of conditions and hardships the modern Army provides us with. Yes, survival is of the utmost importance on the battlefield, but how would a commander feel about losing a million dollar aircraft and three soldiers because a TI, not school trained on a certain type aircraft, was the cause of the accident. That's why we have a specialized MOS for type aircraft—to provide the quality maintenance for those who fly those million dollar plus machines.

SSG Stephen E. McCool
Ft. Devens, MA

***66 Series: Aviation Aircraft Technical Inspectors (TIs)**

66N—UH-1 TI
66T—UH-60 TI
66V—OH-58 TI
66N20—UH-1 TI E5
66N30—UH-1 TI E6
66V20—OH-58 TI E5
66V30—OH-58 TI E6
67F—Former Fixed Wing TI
160A—AWO Maintenance Technician

*Articles from the **Aviation Digest** requested in these letters have been mailed. Readers can obtain copies of material printed in any issue by writing to: Editor, **U.S. Army Aviation Digest**, P.O. Box 699, Ft. Rucker, AL 36362-5044.*

Captain Dan J. Davis
Aviation Officer Advanced Course 86-4-1
U.S. Army Aviation Center
Fort Rucker, AL

Captain Who? Not You!

Welcome to the Aviation Officer Advanced Course.

ABOVE ARE THE first words you hear when you begin the many briefings and lectures for your "Captains' Course." The first thing you realize is that everyone is really glad to have you here at the Aviation Center, Ft. Rucker, AL. After all, you are why there is an advanced course staff; you mean employment.

The second thing (and reason for this article) you realize is that your class is composed of numerous different and diversified types of people. If you have been to the advanced course, sit back and reminisce. If you are going, use this as a guide to understanding the character of your classmates.

CPT Springbutt

CPT Springbutt. What a character! This officer usually sits in the front row. He is involved in an intense battle to be number one in the class. He is also extremely eager to share his vast multitude of experience, wisdom and military expertise. Whether he has ever done anything or not is irrelevant. This individual can be identified in today's classroom by such expressions as, "Sir! CPT Springbutt! During my third rotation at the National Training Center I found that aviation assets were best utilized for . . ." Or, by his continuous seat gyrations every time the instructor asks a question. It is not uncommon to see Springbutt waving his hand in the air or wiggling in his seat to attract the instructor's attention. Once Springbutt has the floor his point is usually irrelevant but since he perceives himself as the absolute final authority on the subject matter, he is undaunted.

CPT Jock

CPT Jock. He's the guy who lives for physical training (PT). There are two varieties of this character—one who absolutely believes in doing PT during every spare moment of every day, and keeps his opinion to himself; and the other who wishes for the whole Army to share his view. The latter revels in leading the class in 2-mile runs at a 5-minute pace so he can bad mouth anyone who doesn't finish the run with the group. CPT Jock doesn't believe in the Master of Fitness program. He will tell you it was written for sissies. The daily dozen is all you need—that, and running a few hundred miles each week. CPT Jock is a class nightmare, but do not fear, the class of sissies will educate him to the error of his ways, one way or another. Jocks are great simulator pilots.

CPT Phantom

CPT Phantom. You may never see this person; he is an expert in the art of infiltration and exfiltration. If he hears the words, "This class is not testable," he will disappear. Where he goes no one really knows. Some have said that he uses modern technology and has himself beamed up. Others believe he is a ghost who only appears in order to haunt the

instructors who give tests. I believe he really exists, but is an expert at deception and camouflage—possibly a "plant" from Infantry, or even Special Forces, sent to check up on the aviation advanced course program of instruction. Whatever he is, he is "out there" waiting to bolt at the mere utterance of the words, "Not testable."

CPT Branch

CPT Branch. Every class receives a visit from Department of the Army Military Personnel Center. You will have the chance to discuss your future and follow-on assignments. For some this is a depressing time. They see their assignment's officer and find out they are not going to Ft. Riley, KS, with their families as they had hoped for these many long months, but rather are being diverted to Ft. Rucker, AL, to teach the *advanced course.* Others will go into their interviews asking for something trivial, such as an F-15 transition and flying with the Air Force out of England. They will be ushered into an overstuffed chair, poured a cool refreshment and have the news broken that they will have to fly F-4s instead with the Air Force out of England. They *believe* it? The disappointment on their faces is heartbreaking. But not to worry, the assignments miracle machine will work it out so they will probably get a space shuttle transition en route to make up for it. Meanwhile, back on Earth, you will be talking it up with your soon to be buddies in DCAT* about what class you will teach. CPT Branch, if he isn't already, should fly C-12s. They are made for each other.

CPT Cavalry

CPT Cavalry. Every branch has some of them. CPT Cavalry prefers to be called "Cav" for short. He is generally shorter then his peers in height, wears strap up tanker boots. This individual lives, breathes and thinks Cavalry and only Cavalry; both ground and air. He sees everybody else on the battlefield as support for the Cav, whether they are an attack helicopter battalion or a ground maintenance company. There is no other branch or unit to be in. If you don't believe it just ask CPT Cav. This guy loves jokes, hates wimps (everybody but the Cav are wimps) and generally is a bear to be around. The home of Cav will be filled with things such as Stiver's Prints of the Civil War, spurs and Stetsons. He calls his wife "the little woman" and his children "buckaroos." If there has ever been an officer totally dedicated to what he does, Cav *is* that person. He lives, breathes and thinks his job. It is a tribute to his wife that she can stand him, especially since most of his classmates cannot. Cav makes a natural Cobra pilot. He loves to see things explode.

CPT Charisma

CPT Charisma. You will know him by his constant chatter, mostly about himself. In the first 10 minutes of your acquaintance he will have told you all about his career, his last commander's career and his fantastic future in the Army. For entertainment put two of these guys in a room and watch them spend the next 6 hours trying to one-up each other. This type can also double as a Springbutt. Charisma can fly anything—just ask him. In a unit, he is probably flying a desk as the assistant mess kit repair officer.

CPT Computer

CPT Computer. He's the last and probably most important officer in every class. He can tell you anything about any computer in the world. When not studiously engaged, he is behind his keyboard in his own world. Never ask Computer a question unless he has access to his computer. He has everything in his data bank including his calendar and the class social roster. If asked, Computer will take all of the notes and raw data produced during class and consolidate them into a study sheet, easily understandable by normal human beings. This is one of the greatest gifts from above that a class can receive, unless the guy won't share his work with the rest of the class. Then he becomes a nerd. Computer makes a good Mohawk pilot gathering intelligence.

Not all of the types mentioned above show up in any one class. I guess we were just lucky, or something. As much as we all would hate to admit it, there is a little of each of these in every one of us. We all possess the potential to spring forth from our chair with some *very important fact* that no one else in the world cares about. It just depends on your attitude that day—whether you could be tagged with one of these nicknames or not.

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* The Aviation Center's Department of Combined Arms Tactics.

PEARL'S

Personal Equipment And Rescue/survival Lowdown

Donna Filipowski *Courtesy of Sikorsky Support Services, Inc.* photo by Joe Lolley

Water Purification Tablet, Iodine, 8 MG

The Food and Drug Administration testing revealed that the following medical materiel was tested and found to be suitable for issue and use provided the unit has a good wax closure and shows no signs of physical deterioration, i.e., rusting of metal caps.

NOTE: New retest date is July 1988.

Mark the retest date on each appropriate container exterior (intermediate and unit containers) with the Defense Personnel Support Center (DPSC) project number D861020XX as authority. Do not obliterate the original date of manufacture.

Prior to applying the new retest date, materiel should be visually examined in accordance with TB 740-10 (DLAM 4155.5), Quality Control, Depot Serv-

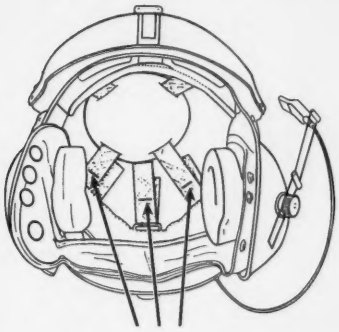
NSN	NOMENCLATURE	MANUFACTURER CONTRACT NO., LOT NO.
6850-00-985-7166	Water Purification Tablet, Iodine, 8 MG	Van Brode Milling or Van Ben
6850-00-985-7166	Tablet, Iodine, 8 MG	Van Brode Milling or Van Ben
6850-00-985-7166	50S Tablet, Iodine, 8 MG	DLA 120-83-C-0567
6850-00-985-7166	Tablet, Iodine, 8 MG	DLA 120-84-C-0020
6850-00-985-7166	Tablet, Iodine, 8 MG	All lots manufactured during 1984 and inspection/test date 1986.

iceability Standards, Appendix M, Medical Supplies, to ensure serviceability of stocks onhand. Materiel which does not pass all inspection criteria should be destroyed in accordance with AR 40-61, paragraph 3-52 and AR 735-11, paragraph 2-10 as unsuitable for issue and use. SAILS ABX 8600284 and 8600285 apply. Materiel is a component of the following major assemblages for Army aircrew personnel: NSN 6545-00-782-6412, survival kit, individual tropical; NSN 6545-00-823-8165, first aid kit, individual; NSN 6545-00-231-9421, medical pack, airman's; NSN 6545-00-120-2632, survival kit, tropical.

The water purification tablets are a component of first aid kits that are contained in Army aircraft survival kits and aircrew vests.

NOTE: All lots of older Van Brode water purification tablets, manufactured prior to 1974, were ordered destroyed by DPSC message R221502Z Jul 1982 and message R071908Z Feb 1985. This destruction notice is not applicable to *Van Brode/Van Ben* tablets manufactured during 1982 or later.

The above information was extracted from PM-ALSE message 171400Z Jul 86, ALSE Number 86-8.



Slippage of SPH-4 Helmet Adjustment Straps

Slippage of the SPH-4 helmet adjustment straps (see below) can be prevented by hand tacking the adjustment straps with one or two turns of Nomex thread (nylon, nonmelting, NSN 8310-00-492-8397) available at Army unit ALSE shops; or cotton thread, specification VT-276, type IV B, ticket #8/4 or nylon thread, specification VT-295 size 3 cord equal. Available through quartermaster facilities where tent repairs or parachute shops exist. Use a surgeon's knot with a locking knot or equal. Ensure the knot is on top of the strap so that the knot will not contact the head.

Water Purification Tablets

Water purification tablets, iodine—NSN 6850-00-985-7166, manufactured by Van Brode Milling Company—*All lots manufactured during 1974 were tested and evaluated for serviceability and failed. Extension of these lots is not approved.* Survey and destroy these tablets. Replacement and credit for these tablets is not applicable.

photo by J. Skinner

Damage to SPH-4 Helmet

This SPH-4 helmet has cracks on both sides and the front. It was damaged during a recent domestic airline flight as check-baggage during which it was protected only by a helmet bag.

The following guidelines will ensure a serviceable flight helmet at your destination if you fly domestic airlines:

- Hand carry your helmet in the helmet bag.
- Ship in a cardboard box with suitable all around packing material protection.
- Ship in luggage with suitable all around protection.
- "LEAST PREFERRED." Ship in the helmet bag with clothing/soft material stuffed inside and all around. (Get a serviceability statement from airline personnel for future claims.) *Jim Cully, Sikorsky ALSE Technician, Ft. Rucker, AL.*

If you have a question about personal equipment or rescue/survival gear, write PEARL, AMC Product Management Office, ATTN: AMCPM-ALSE, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798 or call AUTOVON 693-3817 or Commercial 314-263-3817.

U.S. ARMY SAFETY CENTER

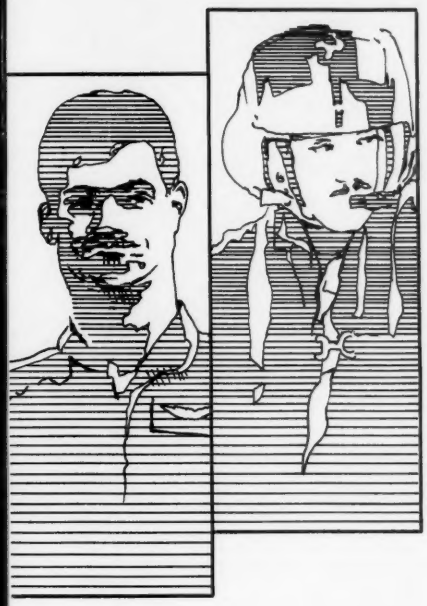
Preventing the Needless Accident—the One Caused by Crew Error

CW3 Francis E. White
4th Aviation Training Battalion
U.S. Army Aviation Center
Fort Rucker, AL

IMAGINE FOR a moment a football team, the head coach knows what he wants the team to do, but he tells only the quarterback. The quarterback knows what he has to do and what the coach wants the team to do, but he tells only the running backs. The assistant coaches know they're supposed to win the game, but they don't know what plays the head coach has told the quarterback to use. The rest of the team doesn't know anything: What the head coach wants them to do, which plays the quarterback is going to use, and certainly not what they're supposed to do to win the game. Winning team? Not on your life.

Trying to run a football team that way and expecting to win is ludicrous. But it's no more ridiculous than a pilot trying to operate an aircraft after telling only his copilot what he wants to do. The copilot knows what the pilot is going to do and has an idea of

The views expressed in this article are those of the author and not necessarily those of the Department of the Army nor the Army Safety Center.



what he has to do to help, but nobody talks to the crewchief, the flight engineer, the loadmaster, nor any other crewmember. They don't know what they're trying to do, and they certainly don't know what they're supposed to do to get it done. So how much help are they going to be to the pilot and copilot?

I don't want to talk about accidents involving a mechanical failure. When that happens, there's no alternative for the crew but to react to it. I want to talk about Army Aviation accidents that are caused by human error. Specifically, I want to talk about *the needless accidents,* the ones caused by crew error, where people didn't do something they should have done, did something they shouldn't have done, or did the wrong thing.

First though, I think I should establish my credentials. Why do I think that I'm the person to talk about crew communication and coordination and crew error? Because for one thing I'm an Army aviator, and for another, I know what it's like to have an accident. I know first-hand about all the soul-searching and trying to look at things in retrospect and decide: "Did I do all that I could've done to prevent that accident? Did I tell the crew enough about what I was doing and what I was trying to do? Was there something they could've told me that would have prevented the accident, but they didn't? Why didn't they? Did they even know what to look for and what to tell me? Were they in the best place in the aircraft to see what they needed to see?"

There's no end to the questions. Some will never be answered although my crew and I talked for hours trying to answer them and trying to take something from that experience that will help somebody—that will help you not to make the same mistakes—that will help you not to have an accident.

Out of all that, I think I have come up with some things that can be done and should be done, and that's what I am writing to you about.

Responsibility For Crew-Error Accidents

Before we can get into preventing accidents, we've got to know who is responsible for them in the first place. The answer is simple. When an aircraft is involved in a crew-error accident, the responsibility for that accident is right there in the aircraft. The crew is responsible. But let's break that down a little more. Within every aircrew, there is a hierarchy of responsibility, a chain of command. It goes like this: the pilot in command (PIC), the copilot, then every person who fills a crew position. That may be a crewchief and gunner; a flight engineer, crewchief and gunner; a crewchief and medic; a crewchief and jumpmaster; or any number of other combinations.

The overall authority and ultimate responsibility for safety of the aircraft belongs with the PIC. But responsibility for decisions affecting the safe operation of the aircraft also rests with any crewmember in a position to give the PIC information that will affect those decisions.

Crew-Error Accident Causes

Crew-error accidents are caused by mistakes in judgment and poor decisions made by the persons in

Preventing Crew Error

continued

charge. The PIC makes the decisions for the safe operation of the aircraft. Now, although the PIC is in command and has final authority for safe operation of the aircraft, he or she has other people to help in the decisionmaking process. That includes the rest of the crew—the copilot, the crewchief/flight engineer, gunner or jumpmaster all have responsibilities to the PIC as his or her staff and assistants in making the right decisions.

I'm talking about simple crew communication and coordination. That includes communication between crewmembers before and during operation of the aircraft. It includes clearance reports, instrument reports, radio frequency confirmation, fuel checks, external load directions and conditions, paradrop procedures, rappeller status confirmation, and on and on.

Simple as that may sound, this kind of communication and coordination many times eludes aircrews because we fail to continually practice it. We fail to recognize the need for it *every time* we operate an aircraft, regardless of whether it is a runup, a maintenance operational check or an actual flight. No matter what is going on with the aircraft, there is always a need for the crew to communicate and coordinate with each other.

The PIC needs to communicate to the crew what his intentions are and the requirements for the mission. In turn, crewmembers must practice putting what they think into words and communicating them to the PIC. The crewmember who thinks, "He's the best pilot in the company; I don't need to tell him; he knows what to do and he knows how to do it," isn't living up to his responsibility. He also may be indulging in false security. Just maybe that PIC *doesn't* know what to do or how to do it. After the accident it's too late to express concern or to question. That needs to happen when it can have a positive effect, when it can help with that decisionmaking process covered above.

In crew-error accidents, we find too many cases where the PIC is unaware of an impending accident and there is another crewmember who didn't tell the PIC something he knew about the aircraft's position or conditions. It might be something about blade clearance, the aircraft's height above obstacles, tail rotor clearance, identification of obstacles, rappeller status, external load status or a lot of other things. *The thing is, someone knew something, someone was aware of something, someone thought something—but they didn't put it into words!* They didn't tell the PIC, and this lack of communication resulted in an accident.

Input from all crewmembers to the PIC allows him to evaluate all aspects of the operation and to make decisions that will ensure safety of the aircraft. Without that input, the aircraft is operated on one person's experience and opinion. Input from the crew makes the operation a joint function and increases the safety factor.

With or without input, the PIC and the copilot (when he is on the controls) often have to make decisions that require immediate response. In these cases, there may be no time for communication and coordination. So, how will they make these decisions? They will make decisions based on their knowledge, experience and judgment. When the outcome is a safe operation, no questions will be asked. When, however, an accident occurs, other factors come into the picture. Now complacency may be added to knowledge and overconfidence may be added to experience. Judgment is determined to have been either good or bad.

We can clearly see how important knowledge, experience and judgment are when decisions have to be made by one person. As we address these three factors, we need to understand that only when they are controlled and directed can they help in making the proper decision and preventing accidents. By looking at each of them individually, we can see that their effect on each of us is different. As we come to an understanding of each factor, we may come closer to seeing how they affect us and how we can use them to improve the decisionmaking process, whether we are making the decision as a PIC or communicating input to the PIC to help him make a decision.

Contributing Factors to Class A, B and C Accidents Since January 1979

	UH-1	UH-60	CH-47
Crew communication/ coordination.*	32%	55%	35%
Pilot technique	27%	13%	10%
Maintenance/CE procedures (not flight-related)	15%	2%	8%
Total human-error accidents	74%	70%	53%

* percentages are approximate

Note: Ft. Rucker initial entry rotary wing training is not included because these are students, not fully qualified aviators.

Knowledge

Knowledge is simply what we have learned through study and being taught. When knowledge is expanded and applied to a widening range of decisions, they become easier to make. In this respect, knowledge can be an avenue toward accident prevention. Knowledge is progressive, and progression in our professional knowledge is a goal we all should have. Sometimes, however, progression is replaced with regression. When we become complacent, there is no ambition to excel. If we are satisfied with where we are in our achievements, we can sit back and take it easy. You might even say we are "retired on active duty," and we stagnate.

That kind of complacency or regression is even more critical in Army Aviation than in some other careers because the profession itself is ever-changing. To be a part of such a profession we have to constantly increase our knowledge. Because of new developments in equipment, new tactical employments or new force structures, individuals involved with Army Aviation must continually learn new ideas, tactics and limits that those changes generate.

When Army Aviation progresses and individuals stagnate, individuals regress in their knowledge. Such regression, brought on by complacency and stagnation, puts an individual at the head of the line for a crew-error accident. If you find that you are not learning something new in Army Aviation, then you are (possibly without knowing it) complacent and regressing in knowledge of your profession.

Complacency breeds a false sense of security and leads toward the crew-error accident. It can be a difficult characteristic to overcome, especially when it is applied to accident prevention. We might say that "complacency is accident prevention's worst enemy and a crewmember's easiest companion."

To overcome complacency, we need to strive for continued excellence by increasing our professional competence and knowledge. This can be done by evaluating personal goals and adopting those that will enhance our performance and make us totally professional in all aspects of our jobs. This adoption of goals should be done continually. Once we achieve one goal, we set another, and another, and so on. Doing that, we can keep from becoming complacent. We achieve our goals, we increase our professional knowledge and we reduce the possibility of becoming another crew-error statistic.

Experience

The next individual factor is experience. Experience is always desired in aviation, but it only comes with time. Even if we have only a little experience we can augment it with knowledge. When we do that we take advantage of the experience we have had and we're in a position to add future experiences. When we look at experience we might say that it's really confidence.

Confidence is performing a task because we have successfully done it before and this time is just another repetition. We have gained knowledge from doing something in the past, and we are confident we can do it again in the future. We build self-confidence from experience and we progress.

Accident prevention is advanced when experience builds confidence and knowledge is gained. But when self-confidence becomes complacency, it quickly grows into overconfidence. This is when we find ourselves in a dangerous area.

Overconfidence is false security that says we can do something even though it may exceed our abilities or knowledge. That's when we overdo; we go one step further than we have the ability to go, and we are doing something unsafe. We may only be wanting to achieve one of our goals, but we may be choosing to achieve that goal before we have the knowledge or experience to complete it safely. We might say that "overconfidence is the overachiever, where complacency was the underachiever." They are both easy companions to the unwary and the enemies of accident prevention.

To bring these two factors into proper perspective, let's just say that we need to be somewhere between underachieving and overachieving. The only way we

Preventing Crew Error

continued

can do that is through judgment (the last of the individual factors).

Judgment

Good judgment is what we need if we're going to establish ourselves as aviators at a level of professional performance that will effectively reduce our potential to cause a crew-error accident. Good judgment is a natural extension of technical and professional competence. Competence is gained by increasing our knowledge and learning from our experiences. To improve our judgment, we must ambitiously review established procedures, and we must never sacrifice our goals or standards as professional crewmembers.

When using judgment to place ourselves between under and overachieving, between complacency and overconfidence, we need to be aware of and understand two important performance limits: our own and our equipment's.

The Army has taken care of some of these limits for us. Operators manuals, aircrew training manuals and unit evaluation programs all establish limits. But, I'm talking more specifically about the limits we establish for ourselves—those we set by self-evaluation and the unit standardization process.

We establish our personal performance limits by continuous self-evaluation, which must take into consideration that each person is different and each has a different limit. We must understand our limits and know when they have been reached. After establishing our performance limits we then need to tie them into the aircraft or equipment limits.

We can do that by knowing the limits that are outlined in the various manuals for the equipment. Things like revolutions per minute, engine temperature, oil pressure and so on are important. But, by equipment limits I mean all of the limits, including rotor clearance, aircraft reaction time and environmental effects on the aircraft. Anything you don't know that restricts an aircraft can cause an accident.

When we know both our performance limits and our equipment's limits, we must never exceed them or allow other people to make us exceed them. *When we stay within these limits by sound decisions based on knowledge, experience and judgment, we cannot be compromised. It all adds up to "accident prevention, good risk management, and protecting ourselves from the crew-error accident."*

But, What If . . .

So here we are, applying all these ideas of maintaining good crew communication and coordination, increasing our knowledge, avoiding complacency or overconfidence, applying our experience toward perfecting our performance standards, and using good judgment to help us make good sound decisions. We are striving for excellence and we're trying to prevent crew-error accidents. *But what if . . .* ? What if, after doing all of these things, we still make a mistake and we have a crew-error accident?

If that happens, we need to reevaluate ourselves and adjust or change what caused the mistake and learn from it. What we learn from it, we can pass on to others. That way we give them the opportunity to enhance their crew communication and coordination skills and to gain knowledge through our experience.

Army Aviation is an awfully unforgiving business. To keep from becoming accident statistics ourselves, we must be extremely cautious and always aware that accident prevention depends on the decisions crewmembers and the PIC make every day. If we are to prevent crew-error accidents, we must know when to stop, when to turn back, and when to make those decisions before it's too late. Good crew communication and coordination, knowledge, experience and judgment are key factors that can affect or alter those decisions. But, if an accident happens, we don't erase the mistake. We don't paint over it. We correct the mistake and learn from it.

Accident prevention has many facets. What I have presented are just a few ideas that can lead us toward preventing the needless accident—the crew-error accident—by helping us to act or by preventing us from acting. We need to replace failed action with action taken, and needless action with professional action.

We must replace the needless accident with no accident at all.

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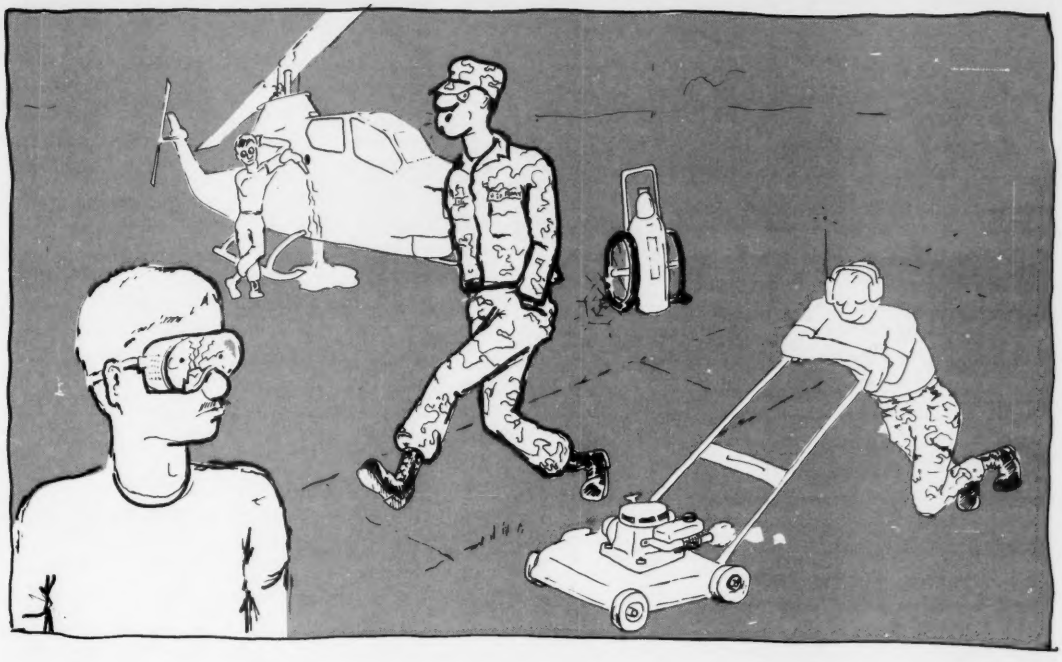

Walking to Work . . . Is It Safe Out There?

Mr. Bobby R. Medley
Headquarters, Second U.S. Army
Fort Gillem, GA

SAY YOU ARE the aviation safety officer in an Army Aviation section somewhere in the United States.

You walk to work one morning and as you pass the flight line some people are refueling an aircraft. Everything looks okay, but as you move closer you notice the person doing the actual refueling is not wearing eye protection. The noncommissioned officer in charge states that the equipment is not available.

Moving on toward the hangar, fuming slightly, you observe another group of people on a grass-mowing detail. The individual operating the mower is not wearing goggles. He notices you standing there and

shuts off his push mower as if he were reading your mind. After conversing with the individual about safety, you proceed in the direction of your office.

Passing by the machine shop, your keen eye for detail observes a cracked face shield being worn by a machinist. The shop foreman informs you that a replacement shield has been on requisition for 3 months.

Suddenly you become alarmed—is the safety program disintegrating right before your eyes? An immediate conference with the supply officer reveals that he is not aware of the problem. An inquiry through the supply channel reveals a defect in the system. The company providing the equipment has lost the contract and a replacement contract has not been negotiated. The fact that the supply of these items has been exhausted has not been surfaced because everyone was assuming the system would work—it always did before. The supply channel promises immediate rectification of the problem.

Still, you have people who don't have the proper equipment to perform their assigned tasks. You, the supply officer and the commander confer, and arrangements for loan equipment are made. The commander assigns a suspense for the requisitioned equipment to be in place. He assigns you the responsibility of reporting to him when the entire defect has been eliminated.

Of course this is an elementary example and perhaps some supply experts would argue that this would never happen, but it does: Clear visors for SPH-4 flight helmets are not always available; correct washers for tail rotor retaining bolts are sometimes hard to find; survival radios have been a problem for years.

Statistics never indicate how many eyes could be saved from thrown rocks, fuel spillage or unidentified flying objects in the machine shop. We have no procedure for determining the number of accidents we prevent.

A proactive aviation safety program is one that employs modern management theory in the elimination of the stagnating effects of previous learning on the performance of later learning. In other words, the fact that a certain method or procedure has been used historically is not an indication that the method or procedure is the safest or even the most efficient way of achieving a desired result.

A method or procedure used to accomplish aviation related tasks should be reviewed constantly by the appropriate members of the chain of command (immediate supervisor, intermediate supervisor, safety officer/manager and commander) and the defects in the method or procedure identified and eliminated. This is not as easy as it may sound. Information about the method or procedure must be collected from the available sources and similar facts grouped together. After the information is consolidated, it must be analyzed and potential hazards identified. The defect allowing hazards to exist in a method or procedure must be pinpointed and a means of countering it implemented. Finally, the command should apply sufficient control measures to ensure that the removal of the defect is accomplished. In some instances an entirely new method or procedure may have to be developed.

The U.S. Army Safety Center is teaching the principles of this management technique; we have had the basis outlined in regulations for years. The technique does not confine itself to aviation—it can be used to manage any program.

The requirement for improvements in the aviation safety field is obvious. The loss of life or equipment is unacceptable. Simply placing the blame on human error, supervisory error or mechanical failure is inadequate. Recording and reviewing statistics as a means of accident prevention is not acceptable. In-depth research into why these system defects exist, the development of viable countermeasures and the implementation and control of these improvements are a must. Every effort must be made to instill the importance of safety in all tactical and support operations.

No matter how well trained our aviators, or how sophisticated and effective our equipment, if they never arrive at the battlefield these points are muted.

Finally, your "day at the office" is finished. As you leave to walk home you wonder . . .

AVIATION PERSONNEL NOTES

Warrant Officer Promotions

Congratulations to all the Regular Army aviation warrant officers selected for promotion to the grades CW2, CW3 and CW4 during 1986.

The selection rate for aviation warrant officers closely paralleled the Armywide selection rate for warrant officers. Overall Army selection rate for all three ranks (CW4, CW3 and CW2) combined was 89.1 percent; the aviation selection rate for the same combined ranks was 89.9 percent. Similarly, when comparing Army and aviation selection rates for each rank, figure 2, they too were very close.

Competitive Category	Army Selection Rate	Aviation Selection Rate
CW4	85.0%	84.6%
CW3	87.6%	90.6%
CW2	99.5%	99.1%

Commissioned Officer Promotions

Congratulations and best wishes to the following Army aviators selected for promotion to brigadier general:

Colonel Walter B. Moore
Colonel Terence M. Henry
Colonel Clyde A. Hennies
Colonel Barry J. Sottak
Colonel Robert L. Stewart

FY 87 Officer Board Schedules

Boards for January 1987 or later are shown in figure 1. Schedules are updated quarterly, and will include enlisted boards when published in February 1987. The following are the scheduled boards as of press time, for fiscal year 1987:

Promotion (All Army Category)	Convening Date
Major General	4 May
Brigadier General	9 June
Colonel	to be announced
Lieutenant Colonel	24 February
Captain	3 February
Captain	9 September
CW4 (AUS)	6 January
CW4 (RA)	10 June
CW3 (AUS)	6 January
CW3 (RA)	10 June
CW2 (RA)	10 June

Regular Army Integration	Convening Date
Warrant Officers	24 August
Commissioned Officers (All Army)	27 April

Volunteer Indefinite	Convening Date
Medical Service Corps	6 January
Medical Service Corps	21 March
Medical Service Corps	28 July
Captain (All Army Category) CVI*	3 February
Captain (All Army Category) CVI	9 September
Warrant Officer CVI	26 May

* Conditional Volunteer Indefinite

Command	Convening Date
Colonel (Combat Arms)	15 September
Colonel (Combat Service Support)	29 September
Colonel (Medical Service Corps)	18 August
Lieutenant Colonel (Combat Arms)	21 January
Lieutenant Colonel (Combat Support Arms)	10 February
Lieutenant Colonel (Combat Service Support Arms)	6 January
Lieutenant Colonel (Project Manager)	20 January
Lieutenant Colonel (Medical Service Corps)	24 February

Service Schools	Convening Date
Senior Service College	21 July

FC 1-219, "Aircrew Training Manual, Night Vision Goggles," A Publication Without a Future?

DURING FEBRUARY 1984, the Aviation Center hosted a night vision goggles (NVG) workshop. Through the 18 months preceding this session, NVG mishaps resulted in 17 fatalities and a loss of more than 20 million dollars. One of the objectives of this workshop was to identify issues contributing to this undesirable mishap trend. All major commands participated, including the Army Safety Center. The workshop proved very productive; however, many of the problems surfaced could only be solved by higher command areas of influence (modification funds, aviator night vision imaging system (ANVIS), availability of infrared filters, etc.). Training manuals, programs and task lists received extensive review.

Mishap findings and previous staff studies conducted by NVG subject matter experts indicated major revisions in NVG training philosophies were needed with regard to basic qualification. Actual NVG mission accomplishment in no way resembled qualification training profiles (mode of flight, airspeeds, altitudes, etc.).

Step one included redirecting emphasis away from the traffic pattern and related tasks to the terrain flight environment and tactical tasks. Qualification training should reflect actual employment of NVGs to prepare the aircrews to safely meet this challenge (train as we fight).

The second step was to eliminate tasks not requiring NVGs and to include tasks that improve the operational effectiveness of NVGs in the combat arena. In addition, reviews indicated each aircrew training manual (ATM) lacked guidance referencing techniques to perform NVG tasks as compared to day visual meteorological conditions: Including this information for reference also would aid in reducing future mishaps.

Keep in mind that during this time the vast majority of reference materials were producing negative impact on the standardization of an effective NVG program. NVG training had to be accomplished in accordance with exportable training packages, programs of instruction, obsolete training circulars, standardization communications, *Aviation Digest* articles, numerous messages from Department of the Army (DA) and varying major Army command (MACOM) directives.

The 12-week period that followed the workshop included a whirlwind of correspondence between the Aviation Center and the MACOMs (concurrence/nonconcurrence, revision of issues, we cannot live with this, but we must include that! etc., etc.). This period was climaxed by an 11-hour marathon meeting convened at the Pentagon (April 1984) that concluded with concurrence from all MACOMs.

The third step was to determine the most productive means to disseminate the numerous changes. Ideally, the new policy and guidance would be incorporated into each ATM; however, in accordance with ATM update schedules, this would take 2 years minimum, and distribution by message would only add to the numerous references needed to conduct NVG flight. The most logical choice seemed to be to field a one-source document incorporating all procedures, guidance and policy for establishment and maintenance of an NVG program. Thus, FC 1-219 was conceived as a quick fix to consolidate references, correct training deficiencies, and seek a positive direction to reduce NVG mishaps.

When compared to other training manuals, initial distribution (December 1984) indicated a well-planned and correct publication. Sure, the cover revealed an aviator in a field jacket who had donned forbidden full face goggles, and a word or two was overlooked (semi, as in annual). But as a whole, there were no lengthy pen and ink changes, gross errors, or misleading, confusing statements.

First and foremost, FC 1-219 was never intended to remain in effect without updates for such a lengthy period of time. Current policy is to wisely incorporate material from FC 1-219 into each ATM as the latter are updated and published. If still required, FC 1-219 will be updated during the second quarter, 1988. The following are some of the areas noted as needing clarification.

• Page 1-6, paragraph 1-3e, "No single pilot NVG flight will be conducted." This does not mean one may place any aviator in the second crewmember seat and satisfy this requirement! It means both aviators will be qualified and current in the aircraft *and* goggles *and* both wearing NVGs. *NOTE:* Aviators not current may perform pilot duties with a qualified and current instructor pilot.

• Page 2-8, paragraph 2-3a, b, "Refresher training is required to regain NVG proficiency." Refresher training is for goggles only and has nothing to do with aircraft. EXAMPLE: If an aviator has performed NVG flight the previous 6 months in any aircraft, refresher training is not required.

• Page 2-9, table 2-3, "Refresher Table." Does the 1.5 hours in the synthetic flight training system or aircraft cockpit count toward the 4.5 to 7.5 *flight* hours? No, this table does not include a note as does qualification training, page 2-3, and paragraph 2-2c(1), page 2-8, states *flight* hours.

• If not assigned to a table of distribution and allowance/table of organization and equipment (TDA/TOE) NVG position, what requirements do aviators have? The aviator must be current with goggles and in the aircraft to fly and satisfactorily complete an annual evaluation. NOTE: If NVG flight is required for your duty position (task list), the annual evaluation becomes a portion of your aircrew training program (FC 1-210, page 2-25d).

• If assigned to a TDA/TOE NVG position, when do semiannual periods begin? The first period begins at the end of the month the annual evaluation was completed and ends 6 months later.

• Page 2-7, paragraph 2-2e, ANVIS qualification has no flight hour requirements (in accordance with FC 1-219); however, local commanders may stipulate requirements as desired.

• Page 2-10, paragraph 2-5, "Mission Training Requirements." The intent of additional training hours was for the aviator to occupy a seat accessible to the controls; therefore, conducting mission training from the jump seat does not meet the intent! In addition, the first sentence states . . . "hands-on flight training. . . ."

Excellent recommendations for improving FC 1-219 have been addressed from the field; however, DA Forms 2028 have not been submitted. (Keep in mind, if you agree, DA Forms 2028 are in order.) Noted below are a few proposals:

• Modification to the annual evaluation to be completed in a designated quarter.

• Page 2-17, first bullet, removing "series" from mission, type, design, reference pilot in command criteria.

• Including cockpit teamwork as a mandatory task for standardization evaluations.

• Fully integrating all crewmembers by requiring crewchiefs and flight engineers to receive formal NVG training with documentation of qualification and currency.

The many complaints of "we cannot live with all the restrictions, we cannot live with the flight hour requirements, this should be determined on a proficiency basis, etc., etc."; we are *living* with it, and a significant reduction in fatalities and mishaps indicates this circular may not have a future but its contents have served us well in its time.

DES welcomes your inquiries and requests to focus attention on an area of major importance. Write to us at: Commander, U.S. Army Aviation Center, ATTN: ATZQ-ES, Ft. Rucker, AL 36362-5000; or call us at AUTOVON 558-3504, FTS 533-3504 or Commercial 205-255-3504. After duty hours call Ft. Rucker Hotline, AUTOVON 558-6487 or 205-255-6487 and leave a message.

U.S. Army Class A Aviation Flight Mishaps

	Number	Flying Hours	Rate	Fatalities	Total Cost (in millions)
FY 85 (to 30 November)	8	257,573	3.11	1	$ 6.5
FY 86 (to 30 November)	4	267,902*	1.49	4	$14.7

*estimated

air-land battle

Brigadier General Rudolph Ostovich III

PART II: Views From Aviation Commanders

Last month the **Aviation Digest** *featured the article, "Air-Land Battle – PART I: Dynamic Changes in Emerging Aviation Doctrine," by Brigadier General Rudolph Ostovich III, who was the assistant commandant at the Aviation Center, Ft. Rucker, AL. The article was adapted from a presentation given by BG Ostovich before a conference of Army Aviation commanders convened at the Aviation Center. This article covers the discussion that resulted among the commanders after BG Ostovich's presentation. They are listed here in order of their first participation in the discussion. All duty stations and ranks are those in effect at the time of the conference.*

Colonel (P) David Robinson
Deputy Assistant Commandant
Aviation Center
Ft. Rucker, AL

Brigadier General Rudolph Ostovich III
Assistant Commandant
Aviation Center

Colonel Walter Yates
Command Designee
6th Cavalry (Air Combat) Brigade
Ft. Hood, TX

Colonel Robert S. Frix
Commander
12th Combat Aviation Group
U.S. Army Europe

Colonel Robert A. Goodbary
Commander
1st Cavalry Division Combat Aviation Brigade
Ft. Hood

Lieutenant Colonel Kenneth J. Gingras
Battalion Commander
7th Infantry Division (Light)
Combat Aviation Brigade
Ft. Ord, CA

Colonel Raymond G. Boland
Commander
3d Infantry Division
Combat Aviation Brigade
U.S. Army Europe

Colonel Barry J. Sottak
Commander
101st Airborne Division (Air Assault)
Combat Aviation Group
Ft. Campbell, KY

Colonel Jack L. Turecek
Commander
6th Cavalry (Air Combat) Brigade
Ft. Hood

Colonel Tommy C. Stiner
Commander
9th Infantry Division
Combat Aviation Brigade
Ft. Lewis, WA

Major General Ellis D. Parker
Army Aviation Branch Chief
and Commander
Aviation Center

COL ROBINSON: I believe difficulties encountered "selling" the combat aviation brigade can be traced to the difference in how people consider the notion of maneuver. Maneuver is dynamic. To gain psychological advantage and achieve surprise suggests gaining leverage from unconventional warfare, which implies risk. If we are to exploit the mobility for which we are paying, we must drive ourselves and pull our comrades who are not aviation-oriented into that third dimension. They will come reluctantly; their education, their bias and our institutions have sold them on the notion of the first and second tiers.[1] As an example, consider the fact that the Blue forces chose to defend.[2] I don't know whether there was a larger context in the operation that suggested an offensive maneuver in that National Training Center (NTC) exercise, but the spirit of air-land battle is to take the offensive.

When we don't get released from that first and second tier, we are drawn into what I call a "pile-on" tactic. That is when the guy on the ground in the first or second tier gets into some kind of difficulty, and he screams for attack helicopters to get him out of trouble. That is where:

- The artillery is,
- All of the focus is,
- We *lose* the key advantage of using our rotor system to hit the enemy at his point of greatest vulnerability and weakness,
- We cause the battle to become multidimensional,
- We fail to capture the synergism of the battle that comes when you take the three tiers and put them together. You then come out with something that is greater than the individual sum of the components.

Another concern is the danger in relating things back to the National Training Center. In my judgment, that sandbox is far too small for us to really do expansive thinking on the order I am describing. We get caught time and time again in the notion of the 30 by 30 sandbox when it might be that was a dynamic of the NTC battle, and that Army Aviation would have been better served had it bypassed it and gone right to the heart of the enemy where it would have done some good. I offer this thought as a perspective that says Army Aviation ought to be released from traditional confinements and encouraged to think bigger, get into some risk-taking, get unconventional, and bring some of the people along who haven't thought about it.

COL YATES: In reviewing what has just been presented,[3] and taking into account what COL Robinson said, it seems the Blue force ground commander in the NTC action, even though he may have called you a maneuver force, had used you as fire support.

Fire support is, "Help, I'm in trouble. Fire for effect."

I suggest if I were being used as a maneuver force, I would have gained contact early on, which is my primary directive—to gain contact first.

Also, I would not have had a liaison officer (LO) down with that ground commander. I would have had a commander with him—the commander is the one who is going to employ the force.

I would not have said, "Come, shoot now." I would have had a plan that said, "When he [the opposing force] gets *here*, and when these points are fulfilled, we are going to kill him *here*. If we blow it and he gets through *there*, then we are going to pass him through and kill him *here*." That is being a maneuver force. What was described from the NTC was a ground commander using Army Aviation as a fire support element, not a maneuver element.

BG OSTOVICH: You are right. The LO in my context should have been the company commander who does the preparation for that battle.

COL FRIX: In my mind, the bottom line is still education. Yes, I think the company commander needs to be there. I think the LO is an absolute necessity for us to educate the people. However, with an 11 to 17 percent turnover rate for ground commanders, which means new people coming in, in order for us to sell our product we have got to sell ourselves. We still must go to the divisional areas and educate them on everything Army Aviation can do for them. We teach this group of ground commanders and staff, and 6 weeks later there is a whole new group. We in Army Aviation must be constantly teaching. Are we talking these things at the various precommand courses?

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1. As established in General Ostovich's article "Air-Land Battle" last month, the first tier of mobility is foot and wheeled speed; the second is track speed; the third is aviation speed.

2. This makes reference to National Training Center maneuvers (the Blue forces being the friendlies) described in last month's *Aviation Digest* article by General Ostovich.

3. General Ostovich's presentation and remarks about an NTC maneuver he witnessed and covered in the November 1986 *Aviation Digest*. Copies are available upon request.

BG OSTOVICH: There is a common core of instruction that is shared among the combined arms team members. Are we talking some of the things we discuss here at Ft. Rucker [Aviation Center] to the degree of sophistication at Ft. Benning [Infantry] and Ft. Knox [Armor]? The answer is no, but certainly what you are suggesting needs to be done.

COL FRIX: That is why we should constantly educate the people in the combined arms team who we are going to be working with. *They have to understand us and we have to understand them.*

COL ROBINSON: I think one of my toughest jobs as a brigade commander was to come up with a guy who was really qualified—the fellow with all that knowledge, and robust enough in that knowledge to go out and talk credibly as a captain on the battle staff of a supported brigade headquarters. I found that if I put a quality guy at the brigade headquarters, Army Aviation was employed properly and innovatively. On the other hand, if I had a fellow who was sort of hanging on and I sent him there just to meet a requirement, I got back what I sowed.

I think it falls on the schoolhouse, to some degree, to build these fellows who have a perspective for LOs and complement that with some special training once they get out there in the brigades and the battalions.

COL GOODBARY: We [1st Cavalry Division CAB] found with the LOs that we not only need a credible guy there, but also that it takes months to generate this credibility and the expertise in an LO. We must take it out of our hides—*bite the bullet*, and leave that sharp young guy there even though he is far better able to serve us somewhere else. In the long haul, we are better off with that sharp guy as LO.

The best LO I had stayed for a year. When I replaced him, the price was *steep*, and the credibility gap *wide*. It is critical for the LO to be in on this combined arms training from the start. I would agree that commanders need to be there some, but the battalion commanders cannot be there for brigade commanders all the time. The LO really plays a vital part!

LTC GINGRAS: At Ft. Ord [7th Infantry Division CAB], COL [Jerry] Childers has bitten the bullet. He is putting his future company commanders down as LOs with the three infantry brigades. They each serve a year, and then come back to be a company commander. That makes people strive to be an LO because the reward for the best is command.

BG OSTOVICH: That brings us to a point I would like to develop. How are you training LOs? In the 7th Infantry Division, you are identifying them through chain of command and sending them out there in sort of a precommand process. Is there any kind of instructional program such as the rights of passage for the light fighter? Do you have a similar kind of thing for your liaison officers before you send them down there?

LTC GINGRAS: No, sir. We just select the sharpest people.

BG OSTOVICH: How do you achieve technical competence in the ground component matters? COL Boland, in your situation, you put a liaison officer with the 1st Brigade, 3d Infantry Division. How does he gain technical competence on the M1 tank and M2 fighting vehicle and all the command and control structures built around those?

COL BOLAND: I don't have an effective training program to do that. He [the LO] does that work for the guys that own it. Although we have a large amount of integrated training that is helping lately, I don't have a dedicated training program.

COL ROBINSON: I had habitual liaison officer relationships and took sharp guys. We used the guy as a point of leverage in order to gain ingress onto the battle staff of the supported brigade headquarters. That fellow became an advocate not only for the combat aviation brigade, but he also became a key player on the battle staff of the supported brigade. He became very credible. Now, you take a guy who is sharp enough, even though his infantry or armor experience is shallow, he can pick up on those things quickly. That is not to be pushed aside as trivial, but I think it is absolutely key for the brigade commander to put his *best* talents across the fence. You'll build important bridges that will pay off in combat.

BG OSTOVICH: Is there a need for a course of instruction or an exportable training package to train liaison officers? Or, is it better to leave it decentralized, so people in the 9th [Division], who have a peculiar motorized mission, can train LOs one way, while people in the 7th [Division], who have a light mission, can train another way?

COL SOTTAK: We [101st Airborne Division (Air Assault) CAB] pay a high price, but each brigade commander has one of my battalion commanders on his battle staff. That is the brigade commander's executive agent for aviation command and control in the brigade sector. Every brigade commander has [with his staff] a lieutenant colonel who is collocated in that brigade tactical operations center.

That battalion commander's primary mission is to orchestrate all Army Aviation assets—tactical and logistical—for that brigade commander who then can fight his own ground battle and worry about leadership at the brigade level.

I would expect to find my battalion commander in the hottest ball game in town, providing assistance to the brigade commander. As a matter of routine, I have a captain LO that has at least been a company flight operations officer, so he has been in the organization for a couple of years. He is the battalion's liaison officer who stays with this battalion for a minimum of 6 months.

When the infantry battalion or brigade go to their prime time training month, they go cycle. The places of business for the battalions' liaison officers normally are with their respective battalions. But, they never show up in their battalion areas, because they go to work every day with the brigade they support. So, because of this, there is a lot of team building and a lot of cohesion. This is what's tough with the Army of Excellence—when we go to the J-series, we probably are going to send an ex-commander to be a battalion liaison officer.

You can have a bright guy, but he has got to know medium lift, utility lift, attack and air cavalry. It takes a long time to train liaison officers and I think they can only assimilate and gain an appreciation over a period of 1½ to 2 years, or he is a training liability to that battalion commander. My thought is if you are talking about heavy division, armor division or mechanized division, you have some conceptual differences—air assault versus light infantry versus airborne. One of my responsibilities as a commander is to train liaison officers. I also charge my battalion commanders to train them.

COL ROBINSON: If we stay on the same glidepath in the [aviation officer] advanced course that we are now, I am not satisfied that we are going to produce, in the long run, people who are going to have the expertise needed to be effective aviation liaison officers. We are currently accessing people into aviation who have experience in infantry, armor, air defense and other areas before they actually come here [Aviation Center] and put on wings. Those fellows are having a significantly different orientation than do the fellows we bring in off the street and put directly into aviation. I accept that as a challenge. I think we have to keep a clear emphasis on that to keep the pot going and keep qualification on other than the aviation issues in the Aviation Center schoolhouse. Maybe that is where we can make a better contribution.

BG OSTOVICH: To summarize the thoughts of this group, liaison officers are indeed considered important; to be effective, they must be embodied with each of these following characteristics:

- Competent,
- Good representatives of Army Aviation,
- Credible within the context of the units in which they are operating.

To gain competency, we look to the schoolhouse to train LOs in the basic and advanced courses.

We fill out their experience base in the context of the divisions and corps in which they are operating—building on what the Aviation Center taught them.

What we do at the Aviation Center is look at our basic and advanced courses to see what we *must* do to ensure that in the long run our lieutenants and captains will have a good combined arms education—one that will sustain what they have learned by virtue of previous assignments. Take a look at us at Ft. Rucker. We do not have infantry battalions, active component tank units or air defense to speak of. So, there is a bill to be paid in the schoolhouse to provide the equipment necessary—maybe even some of the organizations necessary—to ensure a training base for lieutenants and captains. I agree and I think it needs to be done.

We now have Training and Doctrine Command (TRADOC) afteraction reports emerging quarterly from the Combined Arms Center at Ft. Leavenworth, KS. That is the value of our having five soldiers we handpicked for duty at NTC. They are writing lessons learned from this California desert training center. Those lessons learned are coming to Ft. Rucker, where they are plugged into the schoolhouse via the Aviation Center's Department of Combined Arms Tactics and its Department of Gunnery and Flight Systems. If lessons have particular value they are shared with brigade commanders in the field. That mechanism for cross-fertilization is growing.

As COL Robinson said earlier, don't forget that NTC has some great limitations. It is a restricted battlefield and the Army Aviation Branch must continue to hammer home a reasonable, credible story for the employment of aviation. Every attack helicopter unopposed by an Mi-24 Hind, that engages an enemy tracked vehicle, is an unrealistic and unfair contest. We are developing surrogate Hind aircraft at NTC. That will give us a three-dimensional battlefield.

While NTC has some great limitations, it also has some great training potential. COL Robinson and I sat back one day and talked about this battle [witnessed and reported on by BG Ostovich in the November 1986 *Aviation Digest*]—how we would do it differently, capitalizing on the maneuver aspects of aviation, rather than on the support aspects. We concluded this was not the area to fight this attack force. NTC's maneuver ranges make it difficult for attack helicopters to fight, win and survive because both sides are fighting direct-fire weapon systems. Both have fire support plans and indirect firing systems, all focusing on one defile.

One thing infantry and armor cannot do at NTC is take on the threat force early. But the aviation component of the brigade could. I think this is what COL Yates was talking about earlier—the notion of articulating, through the various preparation stages of the battlefield, and, under the brigade commander's control, an aviation covering force that successfully capitalizes on its:

- Maneuverability,
- Early interdiction,
- Attrition of enemy forces,
- Channelizing,
- Forcing the enemy to adopt a change to his plan,
- Forcing him to pay a price before he gets into the close-in battle area.

Army Aviation should be given a mission of reconnaissance and surveillance, and maybe an appropriately selected point to launch an early attack (in the deep context) as the Blue [friendly] force was coming in this meeting engagement scenario. That same force would be under brigade control, available for the continuation of the rear battle. It would have fought as the covering force; had the opportunity to refuel and rearm; and, then posture itself for the rear battle as the Red forces attempt to overwhelm the stable dismounted and mounted ground forces in the close-in scenario. That command relationship is called operational control, and it is fought under the direction of the brigade commander.

COL ROBINSON: I don't know if it was implied in your comment [BG Ostovich's], but in order to be called "maneuver" we should usually have some ground component attached or in operational control. There are some who feel that in order to be called maneuver, we *must have* something other than aviation with us. I argue that would be best executed if it were the exception rather than the rule.

If you accept the three tiers of mobility, and you have a differential in mobility that is considerably greater than wheels and soldiers on foot, you are only as mobile or agile as the least mobile component.

If you accept the idea that it is important for Army Aviation to project its force into the deep battle area and the rear battle area, there are great advantages in keeping aviation somewhat autonomous and then blending it with ground forces when it becomes necessary under conditions of METT-T [mission, enemy, troops, terrain and time]. This typically seems to be an area around which many arguments center.

COL TURECEK: We have talked about it quite a bit at III Corps, and it is going to be a hard decision for the corps commander to tie his aviation—his only really mobile force—to the ground. It would be a rare instance when he would give aviation a sector where the ability to disengage and swing over to do other things is limited.

COL GOODBARY: The 1st Cav is much the same way. We envision the armor or mechanized task forces with the aviation brigade on rare occasions, although we frequently do plan and try to execute those mixes, at least in CPX [command post exercise] form. We understand the division's mobility is greatly degraded if we do that. So, the scenario we find most likely, in terms of having mechanized or armored task forces, would be in an offensive or defensive economy-of-force role. I agree 100 percent. I don't think we want to do that routinely, because we will have to go to level one or two mobility.

COL STINER: I have enjoyed thinking about the three tiers of mobility. I don't see it as a limitation at all, just something to recognize and come to grips with. Aviation does not slow itself down to the speed of infantry attached to aviation. We bring infantry *up* to the speed of the helicopter.

There will be times in the deep battle when mechanized ground forces could go along one axis in one

area of the battlefield, and the brigade commander could send his aviation attack force on another axis—because we don't want to attack from the same direction—and bring them together at the right point and time. That is the difference between coordination and synchronization: you have got to add the depth in space and time to bring it all together. I enjoy thinking about it as an element of recognition, but not necessarily as a limitation to the way we would mix and match forces.

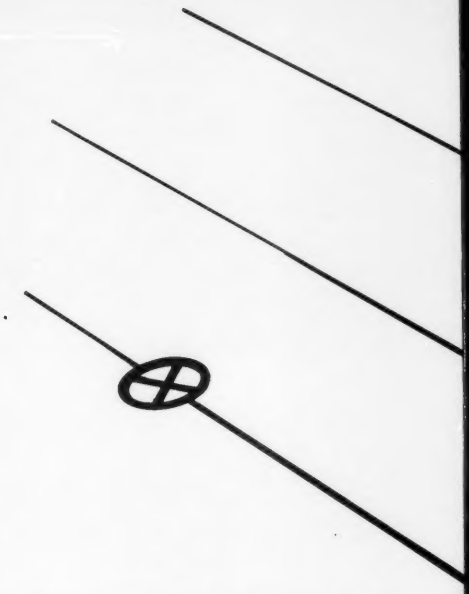
MG PARKER: There is no doubt in the staff's mind about the premium I place on liaison officers. Historically and traditionally, the best marriage on the battlefield has been the infantry and the artillery. That has not been because either one of them went to the other's basic or advanced courses. It has been more on the part of the artillery than the infantry. I don't say that vainly at all, because I have been an artillery man in the past.

Artillery, better than any force on the battlefield, has understood the importance of liaison officers. We have called them by different names occasionally, but that is really how it translates. The longer I watch us perform, the higher the value I place on liaison officers.

As a brigade commander, the liaison officers truly were the brightest guys I had. I inherited a command that had a reputation within the MACOM [major Army command] that was not good, and it was not all deserved. The brigade had done a good job, but according to one major commander of general officer level, our support was not very favorably received. That doesn't help your reputation.

When I was the new guy on the block, the commander was candid in telling me what was wrong. We reviewed what we [the CAB] had done for him in the past 180 days, what he had requested and what had actually been executed. We laid all of that out in spades and we turned over a new leaf. I sent him the brightest promotable captain I had to act as liaison officer at his headquarters.

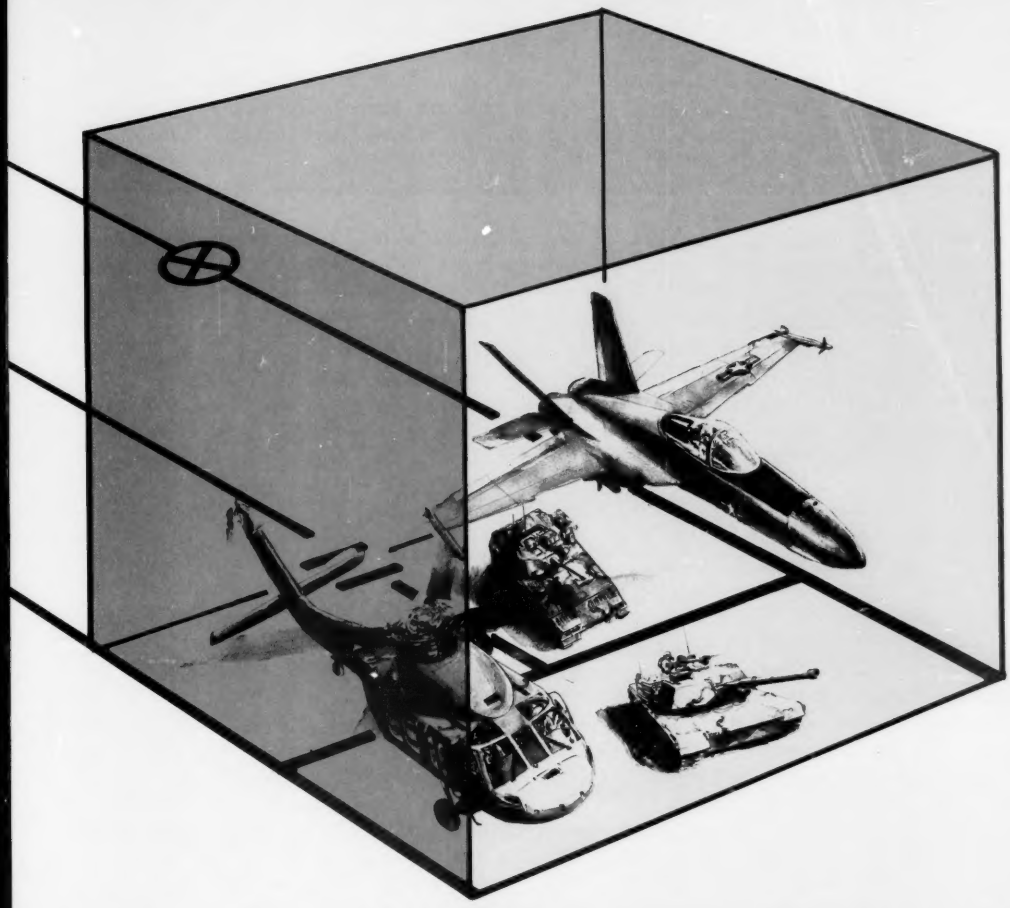
Our LO went with the guidance, "Infiltrate to the point they think you are theirs. Take control of their S3 shop and you decide how we can help them do their jobs better before they even think of requesting anything. Make them think you work for them." Our promotable captain followed that guidance, and just a little more than 90 days later, a beautiful message came in from the same commander, talking about what a complete turnaround the command had done, how much great support we were giving them, all the super things we were doing.



I froze the action at the 90-day level and compared it to the previous 90 days, before we started the new approach. On the whole, we had not done any more for them in the past 90 days than we had during the 90 days we were getting bad reports. The one distinct difference was our bright liaison officer, who they thought worked for them. He turned out to be the brightest guy they had in their S3 shop, and he controlled the action. I am not suggesting you can always do that. I am just using it to illustrate the absolute importance of a bright guy as a liaison officer, and I have never been short enough that I could not provide such a guy.

Even at division level, which people in the operations section and the plans section are starting to plan and conceptualize what that division is going to do? Not a general officer, nor even a full colonel—you have some captains and majors and they may not even be aviators. If you think they are going to make the best use of aviation without having a bright guy in there to help, you are wrong. I cannot overemphasize the *absolute importance* of liaison officers. We will get them back into the structure in adequate quantities as soon as we can.

Concerning the National Training Center—I can remember the division that I was in complaining that we were not given the opportunity to go to the NTC.



We raised enough Cain so they finally gave us a leadership training quota of people to observe what was going on out there.

I suggested the CG let me take the first contingent of brigade and battalion commanders and staff there, then I would come back and report whether we wanted to do that again. I took a representative sampling of principal staff, brigade and battalion commanders. We went through essentially the same thing General Ostovich described to you [see "Air-Land Battle, Dynamic Changes in Emerging Aviation Doctrine" in the November 1986 *Aviation Digest*]. We were briefed on what one normally sees at NTC, and it was both shocking and surprising.

We were able to position ourselves at a key vantage point, monitoring all the radios—the command and control net—and watching the battle unfold from movement to contact, to the end of hostilities. It took 2 hours and 38 minutes before the task force commander did not have anything left to fight the battle. He had lost, although he outnumbered the force by a factor of 4.1 to 1. He had lost *decisively* in that period of time.

As we watched the battle unfold, our feelings could best be described as shock and incomprehension. Our morale was pretty low. We held a caucus that evening after we had heard the critique.

The next day, we watched a particular battle different from the one we had watched the first day. The commander put out his deliberately prepared defensive position that he had worked on many, many hours. From our point on the hill, we could see he was infiltrated. We knew exactly where the opposing force [OPFOR] was located, and they knew what the

commander in the defense was going to do before he did it. The OPFOR was completely wired into him. He had no reconnaissance whatsoever. He was positioned on the desert floor, waiting for them to come. About first light, they did. Hordes of tracks came over the hill. Occasionally, he slowed them down some, but they went right on through him. When we realized, from the NTC guy's critique, that what we had seen was in fact *typical* and not *atypical*, we really did a lot of soul-searching. We were again in a state of shock. We thought a lot about that.

Having sat on four boards in modern times, selecting people for the 06 [colonel] grade level—not just in aviation, but in all branches—I am convinced that we are selecting the best we have. I am convinced that we have some that are as good as you will find anywhere in the world, in any phase of life—civilian, military—regardless of country. We don't have to take a back seat to anyone. If one believes that, then we have to ask ourselves, *why do we go out there and routinely lose to the opposing force?*

Granted, opposing force troops know the terrain like the backs of their hands. They play on that terrain all the time. But, the reasons for the losses are bigger and much more varied than that. Here they are and here's what commanders can do about it:

Permanently list the principles of war in bold colors somewhere in your headquarters. There are principles of banking, principles of flying and principles of trade. Those things are alive and well, and you can see them unfolding in front of you and being violated. There are those who routinely violate the principles. The more of them they violate, the less those people will be noted and remembered for their successes.

The principles of war are valid! Tied to that, and inherent in the principles of war, is the ability to synchronize combat power; not coordinate it.

Synchronization and coordination are two different things. I can coordinate with "him" and think we understand each other, but did we synchronize our actions for tomorrow morning? These are two different things. They're related, but *there is a difference.*

Synchronization of combat power—deconflicting so we don't kill each other—is most critical. I spent 10 days with the Israeli Defense Force counterpart to the TRADOC commander. He told me he had seen combat as a division commander, company commander, battalion commander and brigade commander, and the toughest thing he had to do was not kill his own. He said if he knew how many of his own he had killed, he wouldn't tell me. He wouldn't even consciously admit it to himself. He said it was very difficult; all hell broke loose after the first bullets were fired in anger. All the great plans were not executed as smoothly as had been hoped. He said that was the toughest part of the equation.

If you can deconflict and synchronize that combat power, then you are en route to victory. Why is it that we don't do that so well? If we are selecting the best we have, and they are good, and we have taught them the best we can in the schoolhouse, what is wrong? Let's just go out to the installations first of all, and look at the pieces of real estate and the airspace in which we have to play. It is a postage stamp when you look at the capability, ranges and lethality of today's weapons. They were not designed with those ranges and lethality in mind, so we have the problem of modernizing and upgrading the ranges.

This is my second installation in a row where I have found we really haven't modernized and upgraded the ranges. We have had to go back and almost start over and "retool" the ranges to accommodate the weapon systems that are coming on.

We have an austere chunk of real estate and it is hard to get everybody out there to play at one given time. We have strong commanders who are playing in their own sandbox with their piece of the team. We are allocating this real estate and airspace to them, and most of them are going out and training in a pure vanilla fashion without the combined arms team, without a combined arms task force, which is the only successful way to fight a battle—a combined arms task force organized for the conflict. We don't do it because there are so many impediments to our development of suitable areas and ranges which we need, to fight the whole combined arms as a task force.

Infantry goes out and trains, aviation goes out and trains, artillery goes out and trains because its impact area is over here. Commanders have to think of the smart ways to build an intelligent scenario that makes the training needs of all these flow logically and sequentially, working together. You can make that happen. One of you, some of you, will be division commanders one day. Absolutely forbid a pure vanilla anything to go to the field by itself. Make them go with live training aids; these aids are the rest of the combined arms teams. Only then are you training the troops on how to go out there and fight as a combined arms team. We are not training people to do that now, but we are starting to do it better. It was the consensus of the commanders and staffs I took out to

NTC that this could best be described as a significant emotional event in their lives. They were dead serious about the maneuvers they witnessed, and they weren't even players—just watchers. They will never be the same again after watching that opposing force assault on that California desert floor.

But, let me share a success story with you, about the 101st Airborne Division (Air Assault). It was the second time the 101st went to the NTC. I think when you measure the ability of those guys in the 101st to lay down a base of fire and maneuver, they easily proved they were ready. The troops of the 101st went into that deliberately prepared defensive position and their ranks were not infiltrated that night because they understood the importance of patrolling. It only took a cavalry troop and an attack company that were in contact with the enemy before they moved out of their assembly areas, just as we had been trained to do; nothing magic about that.

The Red attack commenced at 0340 hours in the morning with 144 surrogate Soviet vehicles. At 0630, the 101st destroyed all but 11 OPFOR vehicles and they were just reaching the range of ground TOW systems. It is an example of what aviation can do. I heard our former Chief of Staff tell, quite eloquently, his four-star commanders that aviators do in fact understand combined arms operations better than infantry, armor and artillery troops. If Army Aviation's people are to continue in this posture, we must work hard and continually find ways to improve our teaching of combined arms doctrine in the schoolhouse.

Army Aviation commanders, and other combined arms commanders too, can, and indeed must help us at the Aviation Branch headquarters at Ft. Rucker to ensure that we do not train in a pure vanilla environment. The Army has the right people out there, and we are trying to make an impact with them. We are trying to share, ahead of time, lessons learned and the importance of boresighting.

Knowing how to work with laser equipment is no more or less important than actually boresighting the real weapon system and going out and putting a live-fire round downrange. *It is critical.* We did not know that early on.

We still have many inadequacies that we are aware of, but we are trying to work to get where we can do business smarter. While we are well pleased with your [commanders present at the conference] acknowledgement and recognition of the importance of liaison officers, we routinely lose out there. It is not because we don't have good people. It's because of the way we are training. We have to get out of the current mold and start training and thinking about how tasks are done in the combined arms.

The last time we were getting ready to testify before Congress to justify our myriad of weapon systems—it became apparent to me early on that we had too many people in important positions who had never really thought about the architecture of the battlefield. They ought to start analyzing *everything* we have—engineer, air defense, field artillery—but, chances are, the task force commander is infantry. He thinks about what he is going to do with his infantry and tends to forget about some of the other pieces—the engineer's role and mobility, countermobility, survivability. You have to understand your architecture. You must understand all the weapon systems involved and all the methods of gathering intelligence.

Ideally, don't you want to find the enemy at the greatest distance away from you that you can? Then start deciding what you have to do about it; how to employ all your resources in order to kill the most enemy in the easiest and most expedient way.

You know we will work in the margin on designing and developing weapon systems. It is easy to get a light 105 howitzer that will get a round out there about 11 or 12 kilometers—14 or 15 if you have a 155 howitzer. We always stretch to get that extra few meters of bursting radius, or that few meters of working in the margin. It is that part of capability that costs us so much when developing a weapon system. Yet, we accept the fact that most people don't even know the maximum ranges at which they can acquire and effectively engage the enemy. I said we "accept the fact," but things don't end there. We in Army Aviation are doing all that is possible, and even more, it often seems, to correct such problem areas.

Going back to the liaison officers and something we can do for them—always put together what we call the "brain book." It principally gives liaison officers an architecture that tells them in a brief summary, the operational and organizational concepts of all the weapon systems. The LOs must be the smartest people in the tactical operations center—conceptualizing 72 hours out in front of most others in the center, thinking about how aviation can influence the combat action and help the other arms to achieve full combat effectiveness in the best way possible.

Army Aviation must ensure that it helps its liaison officers to accurately read the architecture of the battlefield and to use *all* combat assets to the maximum advantage of our Army of Excellence.

AVIATION LOGISTICS

Aviation Maintenance and

In 1984 TRADOC approved a three-phase study plan to determine what impact air-land battle doctrine would have on the conduct of combat operations, and to provide solutions to doctrinal deficiencies. Results of the study are discussed in this article.

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THE KEYSTONE manual for Army operations, FM 100-5, "Operations," has undergone extensive revision for the past 5 to 10 years. The evolution of tactical campaign plans from that of active defense to the current air-land battle (ALB) doctrine has precipitated a renewed emphasis in doctrinal studies.

An ultimate objective of these studies is to amplify doctrine in those areas that have historically suffered severely from the lack of an integrated combined arms approach, such as: rear battle; low intensity conflict; command, control and communications; and logistics support to deep operations. Therefore, in 1984, the commander, U.S. Army Training and Doctrine Command, Ft. Monroe, VA, approved the study plan that would evaluate the impact of air-land battle doctrine on the conduct of combat operations, and would also provide recommended solutions to any shortcomings identified by the study.

The ALB Study was initiated as a doctrinal study to be conducted in three phases—the third phase being the most productive for the combat service support (CSS) and related schools. The ALB Study, Phase III, was conducted at sufficient length (9

the Air-Land Battle Study

days of computer documented "wargaming") to allow for an indepth analysis of CSS doctrine based on cumulative effects and trends, rather than maximum support for short duration. The baseline used to provide a means of data generation was a U.S. Army Combined Arms Center, Ft. Leavenworth, KS, corps tactical scenario played on a computer model titled, "Corps Division Employment Model."

Initially, the model was to provide data output that would be used as a basis for determination of requirements and capabilities; this data would impartially establish the study foundations—especially for CSS. As the study effort progressed, it was apparent that data outputs would be insufficient and that an "off-line" analysis would be required. So, for CSS and aircraft maintenance, the analysis relied heavily upon doctrinal research; use of related study efforts; data development among U.S. Army Logistics Center, Ft. Lee, VA, study participants; coordination with the Aviation Center, Ft. Rucker, AL, representative; and off-line doctrinal wargaming here at the Aviation Logistics School at Ft. Eustis, VA.

The focus of the ALB Study, Phase III, was oriented toward the "Operational Level of War" corps and echelons above corps, rather than the "Tactical Level of War" at division and brigade levels. Emphasis upon corps rather than the division was due to ALB doctrinal reorientation and simultaneous force structure initiatives such as Army 86 and the Army of Excellence (AOE), which provided corps commanders and their staffs with the capability to conduct tactical and support operations throughout the depth of their "area of influence"—the deep, close and rear battle.

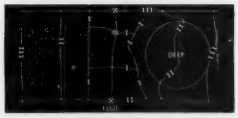
To support and sustain the operational campaign required that CSS functional areas be capable of providing doctrine that is current, integrated and consistent with the four basic tenets of ALB: *initiative, agility, depth* and *syncronization*. The tasking at hand for all Logistics Center schools required an indepth review of published and practiced doctrinal procedures to determine adequacy. The material reviewed ranged from proponent manuals such as FM 1-500, "Army Aviation Maintenance," up through Logistics Center integrated publications such as FM 100-15, "Corps Operations."

As a result of the scenario analysis it was determined that, in general, current Army Aviation maintenance concepts are sound and support the corps

and echelons above corps commander's operational requirements. But, as was the case in all other areas of CSS, it was determined through scenario related insights that current published doctrinal material has become outdated and does not provide current information to the soldiers in the field. Those doctrinal deficiencies that were gained as study insights requiring either documentation or clarification are explained below:

Corps Aviation Maintenance Command, Control, Communication and Intelligence (C^3I) Network. Attempts to analyze ALB Study, Phase III, were continuously hindered by a lack of clearly written doctrine supporting the ALB concept. Nor does current doctrine reflect the AOE force structure that fights the battle. The integrated support relationship between the divisional and nondivisional aircraft maintenance companies (AMCs) infers a management responsibility at the nondivisional level. This responsibility is viewed to be a relationship similar to what currently exists between main and forward support elements of a division. Also, to achieve a rapid and responsive support structure, there would have to be a clearly defined C^3I network that, whether manual or automated, should identify information requirements and decisionmaking processes at all levels in the system.

Current doctrine does not detail the policies/procedures used above the tactical level to manage aggregate corps requirements. The success or failure of ALB depends heavily on the ability to prioritize requirements and to implement a rapid shift of resources to support surge conditions. The communication and information net should provide planners at the command level with the means to coordinate efforts in a real-time manner based upon accurate and current subordinate workload profiles. The ALB Study points to the need to clearly define these job descriptions and unit mission responsibilities in doctrinal terms, and to translate recent AOE developmental accomplishments into doctrinal "how to support" manuals.



Deep Operations. The extended operations conducted under ALB doctrine, i.e., the deep attack and deep maneuver, required an indepth analysis of CSS requirements and capabilities. The result of the doctrinal research effort was that there were no developed guidelines to follow. In fact, there was clearly a doctrinal void. The relatively recent deep battle action plan effort attempted to address this problem and at best served as an indicator that additional work is required. The aviation maintenance support concept developed for the ALB Study initially paralleled the concept for support of the covering force operation—with some modifications.

The requirement to support a division or corps conducting a movement deep into enemy or unsecured territory requires the acceptance of some basic assumptions:

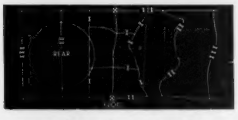
- Depending upon the distance, a days-of-supply should be established.
- The accompanying support should be 100 percent mobile and autonomous.
- Resupply will be the exception to the rule for a given period.
- Cannabilization authority resides with the forward support element.
- Aircraft combat maintenance/battle damage repair (ACM/BDR) will be the standard maintenance procedure and recovery efforts will be limited to the early hours of the operations. The guidelines listed above provided a basis for formulating a support plan for deep operations. They are by no means the consensus of the logistics community, but they do provide a start point for discussion, which is the basis for the ALB Study, Phase III.

Close Battle (Covering Force Operations). Covering force operations may require that modified maintenance procedures be developed as standard practice for planning purposes. Published doctrine does not adequately address this area. The intensity with which the initial covering force

battle was fought in the scenario, combined with the short time period involved, required that modified procedures be adopted to support covering force area (CFA) mission accomplishment.

The mission of the covering force dictated that the maximum amount of combat power be sustained for a short duration as opposed to a managed program that provides an availability rate to sustain operations. Since conventional recovery operations by ground and air were infeasible in the CFA, the concept for support in the ALB Study scenario relied upon ACM/BDR techniques. Battle damage repair contact teams from the aviation unit maintenance (AVUM) company of the squadron, the AVUM element of the attack battalion operational control, and additional teams provided by the aircraft maintenance battalion (corps) provided the primary vehicle to support the initial covering force operation.

The ALB Study, Phase III analysis indicated doctrinal requirement to develop procedures specifically oriented toward covering force operations support. The initial method of support outlined above was the only feasible concept to support this particular operation. Any given grouping of maintenance officers would demonstrate differing amounts of support to this concept and could probably offer other methods that would support the operation. But, recognition that covering force area operations present peculiar circumstances should justify the development of planning guidance and considerations that offer alternatives when supporting violent/short duration operations. The tradeoff between support of tactical mission requirements (short-term, maximum asset available) and the degraded status of a unit at a future time is a question that should be addressed for support personnel in the field.



Rear Battle. Doctrinal procedures are required to fully address maintenance support operational procedures during rear battle operations. The primary operational purpose for waging the rear battle is to retain freedom of action to support the close and deep battle. Aviation maintenance units must plan to prevent or minimize enemy interference and disruption of their maintenance support operations. But, current deployment, operational and structuring doctrine do not effectively address measures to prevent degradation of support during the rear battle.

Given the capabilities and doctrinal intent of Soviet forces to destroy and disrupt combat service support operations with Threat Level I, II and III forces,* aviation maintenance units face a potentially severe degradation of overall capability. Current doctrinal employment of AMCs make them easily identified and targeted.

By deviating from the current way we employ our maintenance companies, a partial solution to the signature problem can be realized. Instead of operating as a single large organization, several small maintenance cells can displace in the vicinity of the unit headquarters/operations center. These smaller operations actually constitute functional area maintenance cells that can be better concealed using currently available methods. Under this deployment scheme, units under attack would experience degradation to only a part of their overall capability. Sections displaced from the targeted area could remain in operation or be deployed to assist in eliminating the threat. This kind of doctrinal change would require minimal modifications to existing organizations, primarily to C³I structures.

Aircraft Recovery. Current doctrine for aircraft recovery does not provide a rapid and responsive system for support of Army Aviation requirements. Conventional maintenance has a system that supports recovery operations down to the owning unit. A towbar and a similar vehicular system initiates the process of recovery/evacuation and repair.

As a part of the conventional maintenance sys-

*Level refers to size. *Level I:* platoon size force. *Level II:* company size force. *Level III:* battalion or greater size force.

tem, dedicated recovery vehicles exist down to the brigade/battalion level and are used for the sole purpose of recovery.

For Army Aviation, the asset required to recover a majority of the aircraft fleet is the CH-47 Chinook helicopter, a corps asset. Under normal circumstances, if a CH-47 is needed, it will be requested through the division transportation officer/movement control center transportation support system. This request will be forwarded through channels until it is approved as a tasking. This means that to recover by air, aviation recovery requests compete with all other transportation requirements, and there are no *dedicated* aircraft recovery assets available within the corps. The analysis of the ALB Study, Phase III, highlighted the increased significance of having corps medium lift helicopter units. The requirement to rapidly move troops, supplies and equipment about the battlefield severely taxed the transportation system, especially the CH-47s and their crews. Heavy reliance upon these medium lift helicopter assets indicates that aerial recovery of aircraft according to current doctrine may not be as responsive as the system requires.

Unit Mobility. Maintenance units in the division and corps do not possess the mobility required to support tactical and operational maneuvers portrayed in ALB scenarios. ALB doctrine dictates the maneuver of entire divisions and corps to execute operational plans. This requires the critical support elements for these organizations to possess mobility fairly consistent with the units they support.

Division and corps aircraft maintenance companies currently are configured with less than adequate organic transportation capabilities. Doctrine states that these inadequacies can be overcome by external support assisting in unit displacements or supply delivery. But, the ALB Study demonstrates that external transportation assets are quickly stressed in their ability to respond to these requirements. Also, the pace of battle demands a speed of execution incompatible with the time required to coordinate and deliver external transportation support.

The Army Aviation maintenance system further compounds the problems of supporting the mobility requirements of ALB. Nondivisional aviation intermediate maintenance (AVIM) units at corps carry dual missions. They support corps aviation units directly and are responsible for 25 to 46 percent of the divisional workload passback, by doctrine. By lightening the workload at the division AVIMs to enhance division mobility, we have further burdened a support unit that now is required to be as highly mobile as the units it supports under ALB doctrine.

Current *aviation maintenance capabilities and doctrine,* then, are *inadequate* to support the mobility demands of the ALB. An optimal solution would be to maximize the organic capability of division, corps and echelon above corps aviation maintenance units to conduct relocation and resupply operations without external assistance. But, the cost of 100 percent mobility may not be affordable in the near term. An alternative is to habitually associate and dedicate corps and division transportation assets with aviation maintenance units to execute the type and quantity of movements required to support the ALB.

Nuclear, Biological and Chemical (NBC). Doctrinal and materiel advances have not progressed to a level acceptable to sustain operations in an NBC environment. Analysis of aviation maintenance doctrine in an NBC environment, and specifically the chemical environment portrayed in the ALB Study, identified doctrinal and procedural shortcomings. In the study, the fluidity of aviation missions and extensive use of aviation assets through the entire battlefield significantly increased the potential for regular and deliberate penetration of contaminated areas.

While some aviation maintenance elements were gamed under chemical attack in the ALB Study, the full impact of sustained use of NBC munitions was not fully developed. As such, the Army Aviation

Logistics School has identified insights and doctrinal shortcomings regarding aviation maintenance in an NBC environment. These issues regarding aviation maintenance in an NBC environment must be addressed doctrinally. The potential degradation of aviation maintenance operations will directly affect the Army's ability to support ALB doctrine.

Logistics Estimates. Data, criteria and methodology have not been sufficiently developed to adequately assist in performance of logistics estimates to assist commanders who are weighing tactical alternatives. Currently, past experience or "best guess" is the only methodology available. To support the ALB tenets (agility, initiative, synchronization and depth), the logistician must have a methodology for calculating the effects of an operation.

Aviation maintenance is concerned with factors such as:

- Threat capabilities against friendly aviation force structures.
- Reliability, availability and maintainability statistics.
- Human factors under sustained operations, and a multitude of other related factors.

Under current training conditions and standards, the methods of evaluating operations (listed above) are beyond the scope of normal instructions. Typical reference manuals are inadequate as guides since they do not provide any indepth information. So, any logistics estimate that could be performed by a logistician would be based upon past experience or best guess formulas.

The fallback solution to the issue may be similar to that used by the ALB Study, Phase III action officers—computer models. Automation is being proliferated to all levels within the division and corps. The programs may already be available and with modification, they could be used to project risk based on current readiness profiles.

Regardless of the final solution achieved, whether it be nomograms as the Transportation School has suggested, or planning factors and formulas as the Ordnance School (at Aberdeen Proving Ground, MD) has proposed, the requirement to provide a solution has been established by this study. The insights discussed in this article are not necessarily considered to be blinding revelations, but they are intended to serve as a start in updating Army Aviation logistics doctrine. The overlapping processes of doctrinal development and force structure modernizations (Army 86 through AOE) have required efforts normally extending over a decade to be condensed into a 1- to 2-year process. As a follow-on action of insights gained from the ALB Study, Phase III effort, the task of revising and updating proponency procedures and published literature has begun. FM 1-500, "Army Aviation Maintenance," is being updated with a scheduled publication date of the third quarter of fiscal year 1987.

Other efforts to further improve Army Aviation logistics procedures have been initiated at the Aviation Logistics School with the Aviation Brigade Combat Service Support Study, which will address the entire package of support for the Army's newest combat arm and maneuver arm—Army Aviation.

The most effective method to assure success in our efforts is to invite and encourage support and input from the subject matter expert base in the field.* Therefore, comments or suggestions from you in the field would greatly enhance our efforts.

Our goal at the Aviation Logistics School is to refine and document a support system that will not only meet, but shall also exceed, requirements that will exist on the highly volatile and lethal air-land battlefield.

Aviation logistics is our profession!

*Write to Concepts and Studies Division, Directorate of Combat Developments, U.S. Army Aviation Logistics School, Ft. Eustis, VA 23604-5417. Or call AUTOVON 927-6807 or 6817.

ATC ACTION LINE

Global Positioning System

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The NAVSTAR Global Positioning System (GPS) is a space-based radio navigation system designed to provide users of all services with worldwide, three-dimensional position and navigation information to enhance such missions as adverse weather weapons delivery, reconnaissance and rendezvous. Also, GPS will replace some existing navigational aids (NAVAIDs) for point-to-point navigation.

NAVSTAR GPS is composed of three major segments:

• *Space System Segment* will deploy 18 satellites providing near-circular, 12-hour orbits in six orbit planes. With three equally spaced satellites in each orbit plane, at least four satellites will be in view to provide three-dimensional positioning and navigation to users located anywhere on or near the earth.

• *Control System Segment* consists of widely separated monitor stations that passively track all satellites in view and accumulate ranging data from navigation signals transmitted by the Space System Segment. It will be made up of four or more monitoring stations for tracking, a master control station for determining signal accuracy, and upload stations for relaying data to the satellites.

• *User System Segment* consists of a receiver, antenna, computer and control/display unit that passively receives the GPS navigation signals and determines its own position. Required accuracy is stated as 16 meter spherical error probable. User equipment for Army application consists of airborne sets and a manpack/vehicular set. Airborne sets will have a standard two-channel receiver processor unit, a standard control display unit, an antenna and an antenna electronics unit.

The GPS sets will enable selection and display of these items: present position and altitude; ground speed; ground track; day of week and time of day; *regarding selected waypoints*—position and altitude of/slant range to/bearing to/horizontal distance to/time-to-go to/desired course angle to/desired vertical angle to; cross-track error from desired course; vertical error from desired path; track angle error between desired course and ground track; set/satellite status; and position accuracy figure-of-merit. The sets are capable of being initialized/programed manually by operator entry of data; automatically, using a resident time source and data stored in set memory; or with data from other host vehicle subsystems.

The NAVSTAR GPS Operational Test II (OT-II) was conducted at Ft. Huachuca, AZ, from 1 Nov 1985 to 31 Jan 1986 to provide data and associated analyses on the operational effectiveness and suitability of the NAVSTAR GPS Army User Equipment.

The OT-II of the two-channel (helicopter) set met the objectives of providing human factors information and hands-on operations by tactical troops executing typical aviation missions in an operational environment. The test also provided a limited demonstration of the one-channel (manpack/vehicular) set to verify fixes not requiring a formal OT-II.

OT-II showed the GPS "system"—space segment, control segment and user segment—is in the development stage; however, there was greater usable satellite availability and fewer satellite problems than during earlier field trials.

Based on a decision of the Joint Resources Management Board, Jun 1986, NAVSTAR GPS was approved for low rate initial production for further test and evaluation. OT-III is scheduled for 1989, with a production decision in early 1990.

GPS is a highly accurate, worldwide, all-weather position determination and navigation system suited to the needs of the Army, Allied military services and the civilian community. Results from Phase I testing have verified that the system operates as conceptualized and that the accuracy goal is achievable. Phase II of the program has provided added assurance that the GPS system will meet or exceed design goals. The culmination of the Phase II effort, emphasizing operational testing, will ensure a field-ready GPS system capable of operation in a military environment. Consequently, GPS has been selected by the Army as a radio navigation system to replace or supplement many other NAVAIDs now in use.

GPS is the anytime, anywhere navigation system for today and tomorrow.

Readers are encouraged to address matters concerning air traffic control to:
Director, Aeronautical Services Office, Cameron Station, Alexandria, VA 22304-5050.